

---

# The role of the circular economy in achieving sustainable development of natural resources (waste treatment and conversion into organic fertilizer)

**Bendjim Meriem\***

Tahri Mohamed University of Béchar(Algeria)

**bendjim.meriem@univ-bechar.dz**

Received: . 11/11/2025

Accepted:14/11/2025

Published: 20/12/2025

---

## **Abstract:**

If there is a need to search for an alternative model to the linear economy one that preserves the health of humans and living organisms, enables the sustainability of life and resources, and works to reduce and safely dispose of waste in landfills-then the circular economy model offers that solution. This model, characterized by its international scope, encompasses the global production system, which has led the United Nations to adopt it in setting the Sustainable Development Goals. Under this model, all "waste" becomes "food" for other processes: either as a byproduct, a recovered resource for another industrial process, or as renewable resources for nature for example, organic fertilizer.

In this research, we aim to establish the interrelationships to realize the dream of sustainable development by utilizing the simplest loop in the circular economy: the recycling of waste and residues to create competitively valuable outcomes for Algeria's economy.

**Keywords:** Circular economy; sustainable development; recycling; organic fertilizer.

**Jel Classification Codes:** Q24; O44 ;Q56

---

\* Corresponding author.

# **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and conversion into organic fertilizer)**

---

## **1-Introduction:**

The implementation of the circular economy is considered one of the most prominent challenges that various countries around the world strive to achieve, due to its numerous benefits on multiple levels, whether economic, environmental, social, or others. This has led Algeria, like other countries, to seek an effective strategy and system that would help it achieve sustainable development ensuring the preservation of its natural resources on one hand, and the exploitation of its waste on the other in order to reduce resource wastage and combat pollution.

### **1.1. Problem Statement**

The circular economy is an economic system aimed at eliminating waste and the continual use of resources. Circular systems utilize reuse, sharing, repair, refurbishment, remanufacturing, and recycling to create a closed-loop system, which minimizes the use of resource inputs and reduces waste emissions, pollution, and carbon emissions. The circular economy also seeks to maintain the use of products, equipment, and infrastructure for a longer time, thereby improving the productivity of these resources. From this, the problem of this research emerges in:

**How does the circular economy contribute to supporting and achieving the sustainable development of natural resources through the process of converting waste into organic fertilizers?**

To answer the above problem, the following sub-questions have been formulated:

- What is the concept of the circular economy and what are its key principles?
- What do we mean by the sustainable development of natural resources?
- How is waste converted into organic fertilizer?
- How is sustainable development achieved through the process of converting waste into organic fertilizer?
- How can Algeria benefit from implementing the circular economy model?

### **1.2. Study Objectives**

This study aims to clarify:

- How reliance on the circular economy is established.
- How to achieve economic rationality in production behavior.
- The gradual abandonment of the linear economy to reduce costs.
- Achieving the goals of sustainable development by fulfilling the goals of the circular economy.

### **1.3. Study Methodology**

The study relies on the descriptive-analytical method in an attempt to solve the research problem, focusing on studying the current reality through deduction

and inference to reach an understanding of how to face the challenges of implementing the circular economy model in Algeria through the process of converting waste into organic fertilizer, so that it plays a role in achieving strategic objectives for preserving natural resources.

#### **1.4. Previous Studies:**

– Study of Manuel E. under the title of Morales and others, *Theoretical Research on Circular Economy and Sustainability Trade-Offs and Synergies*, Sustainability 2021. This study addressed the circular economy and sustainability trade-offs and synergies. The researchers directly explained the relationship between several circular economy goals and sustainability, alongside the Sustainable Development Goals. Furthermore, it was determined that circular strategies that generate more synergies are those related to material preservation deriving materials through recycling, downcycling, and measuring indicators or reference scenarios. The approach considered not only the environment but also efficiency, policy, and technological innovation. Similarly, particular reference was made to its connection with many SDGs directly related to life, water, and health.

– Study of Paul Ekins and others, under the title of *The Circular Economy: What, Why, How and Where?* Organization for Economic Cooperation and Development, European Commission 2019. This study addressed the issue: *Circular Economy What, Why, How, Where?* It aimed to clarify the theoretical foundations and concepts of the circular economy and how to achieve it. It demonstrated the extent of the circular economy's implementation in China, the European Union, cities, and regions. Ultimately, it concluded that the circular economy is more environmentally sustainable than the linear economy.

– Study of Ben Moussa Nabil, under the title of *The Role of the Circular Economy in Achieving Sustainable Development*, Economic Diversification Journal, 2022. The research problem was the role of the circular economy in achieving and serving sustainable development. The study highlighted the role the circular economy plays in reaching sustainable development by addressing the main economic and environmental contributions that the circular economy can provide through the process of transforming waste from an economic and environmental burden into an economic resource that contributes to creating added value for the economy and reducing the risks that waste poses to the sustainability of communities.

When we analyze the previous studies we observe that the studies agreed on the following:

# **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

---

- The importance of transitioning from a linear economy to a circular economy, as the latter is more sustainable than the former.
- The significance of the circular economy and the necessity of adopting it, as it contribute to stimulating economic growth and reducing poverty. The studies also highlighted the circular economy's contribution to sustainable development.

## **2 .Sustainable development**

### **2.1. The Concept of Environmental Development**

Environmental development is considered one of the fundamental dimensions of comprehensive and sustainable development. It means "preserving natural resources, biodiversity, and striving toward the unity of ecosystems." It is also defined as "enhancing the efficiency of resource utilization in a way that meets and respects the needs of present generations without wasting or depleting them, and preserving them for future generations through environmental balance strategies as a regulating axis" (Liane, publication date 2023, p. 47).

### **2.2. Objectives of Sustainable Development Liane, publication date 2023, p. 48):**

Environmental sustainability seeks to achieve a set of objectives that serve both the environment and humanity, now and in the future. These objectives can be summarized as follows:

- Reducing the depletion of natural and environmental resources and utilizing them correctly.
- Relying on innovative developmental and restorative practices and methods that help protect the environment and prevent harm caused by urban and technological advancement.
- Preserving the ecological and natural system and biodiversity.
- Establishing strict regulations and laws to control human activity and committing to international agreements aimed at protecting the environment and biodiversity.
- Supporting and promoting environmental and social responsibility among individuals and organizations in society.
- Using clean, environmentally friendly technology and increasing human and organizational awareness in protecting the environment.

## **3. The Circular Economy**

The circular economy is considered a sound system for transitioning from current economic models—characterized by their unsustainable nature to models of a more sustainable nature. Interest in the circular economy began in the late 1960s, with the aim of providing a better alternative to the linear economic models

dominating industry, which led to the depletion of natural resources and environmental degradation. The circular economy seeks to promote reliance on what is known as closed-loop production patterns within the economic system, thereby achieving a balance between industrial production and the preservation of the environment and its natural resources.

### 3.1. Definition of the Circular Economy

The circular economy is an economic and industrial system based on the reuse of products and raw materials and the ability to regenerate natural materials. It also works to preserve value, reduce its destruction, and maximize its creation within the overall system (Latifa bekkouch and others, Benchmarking in wastewater treatment plants: A tool for, 2021, pp. 158-159).

It can be said that the circular economy is an economic model based on multiple stages aimed at extending the lifespan of resources that exist in the form of waste, and benefiting from them in producing other goods and products through recycling and redesigning them in different and innovative ways, while reducing pollution and environmental damage (Lakhdar & Safia, 2019, p. 04).

The circular economy is about creating complete loops of material flows, to induce a shift from consumer to user, and to enable the decoupling of resource use and environmental impact from economic growth. In turn, circular business models aim to reduce costs, increase revenues, and manage risks, as well as provide opportunities for the banking sector to finance and contribute to the transition toward sustainability.

### 3.2. Definition of the Circular Economy (Al-Rumaidi, 2018, pp. 31-32)

- Changing various unsustainable consumption and production mechanisms (rationalizing consumption).
- Preserving the utility and value of resources and products for as long as possible in the economy (resource conservation).
- Significantly reducing all types of waste.
- Enhancing energy efficiency and effectiveness at various stages of extraction and production (sustainable production).
- Creating sustainable job opportunities.
- Preserving the environment and achieving sustainable development.
- Decoupling economic growth from resource use at both economic and environmental levels.
- Reducing price volatility.
- Enhancing security in supply chains.
- Preserving ecosystems and raw materials.
- Significantly reducing greenhouse gas emissions.

## The role of the circular economy in achieving sustainable development of natural resources (waste treatment and

- Limiting society's dependence on scarce natural resources by maximizing the use of available resources, reusing them, and minimizing waste.
- Creating value through transformation and recycling.

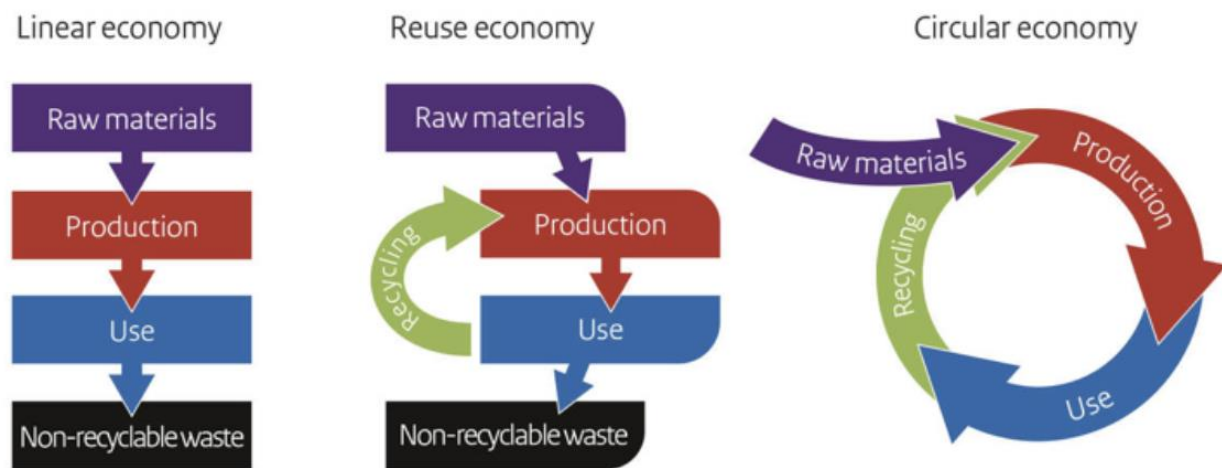
### 3.3. The Difference between the Circular Economy and the Linear Economy:

In order to clearly understand the circular economy, it is necessary to clarify the difference with the traditional model, which is the linear economy.

- Linear Economy: It is an economic model based on following a linear and one-way path in the manufacturing process, starting from the search for and extraction of resources, then passing through the manufacturing process and producing the product in its final form, until it becomes consumable, after which it turns into unused waste (Furkan Sariatli, 2017, p. 32).
- Circular Economy: It is an economic and industrial model based on viewing final waste as resources that can be utilized and transformed into new resources, which leads to extending the life of resources, reducing pollution, and preserving natural and environmental resources (Lakhdar & Safia, 2019, p. 04).

The following diagram illustrates the difference between the linear and circular economy:

Figure(1) : The difference between a circular economy and a linear economy



The source: (Thong Guan, 2021)

Hence, the linear model does not utilize waste nor consider it as a resource exploitable for the production of other goods. This model contributes to an increase in waste levels, environmental harm, and the squandering of resources that are already suffering from scarcity and depletion. As for Algeria, whose economy relies on petroleum, natural gas, and related materials, it is now examining the drawbacks

of excessive dependence on the petroleum-based economy and is striving to achieve a qualitative shift toward the circular and green economy to reap their benefits due to the significant difference between them, as illustrated in the following table:

Table (1): Comparison between the current oil-based economy and the green economy/ring

<b>Comparison Aspects</b>	<b>Petroleum-Based Economy</b>	<b>Circular/Green Economy</b>
Environmental Impact	Creates environmental problems	Environmentally friendly
Resources	Non-renewable	Renewable
	Costly	Abundant
Technology	Chemical / Physical	Chemical / Physical / Natural
	Single technology	Multiple technologies
	Simple	High efficiency
	Energy intensive	Advanced
Product	Single product	Multiple products
	Relatively low price	Relatively costly

The source: Prepared by the researchers based on (Mou, 2021)

As the table shows, the state's efforts toward establishing an environmentally friendly economy have many reasons. In contrast, there are numerous advantages that the state stands to gain as a result of adopting an eco-friendly economy all in pursuit of realizing the dream of sustainability.

#### 3.4. The Circular Economy and Its Role in Preserving Natural Resources:

The essence of this model lies in retaining resources within the economy for as long as possible and minimizing waste generation. This is achieved by designing durable, robust, repairable, and upgradable products, remanufacturing them using secondary raw materials and waste extracted from current products, recycling them into new products, and dismantling outdated products for repair and resale. This extends their usage cycle, conserves limited natural materials, and consequently creates added value. This is achieved through (Suzy Adly, p. 16):

## **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

---

- Contributing to enhanced efficiency, reduced electricity use and carbon dioxide emissions, and creating sustainable job opportunities through ongoing recycling processes.
- Aiming for sustainability by keeping resources and materials at their highest value and utility through the use of modern technologies, especially since they always retain economic value no matter how many times they are recycled.
- Using clean, renewable energy sources that are environmentally friendly, pose no threat to sustainability, and are not subject to depletion. Although their use incurs high short-term costs, they prove more cost-effective in the medium and long term.

### **4-Case Study: Waste Conversion into Organic Fertilizer**

Algeria aspires to become its own food basket; it lacks neither wealth nor capabilities that could create an obstacle. As for the challenges and climate changes, and the instability of conditions on both the global and regional levels they affect almost all economies without exception. Yet today, Algeria is capable of reaching the dream of sustainability in the upcoming phase by efficiently and effectively utilizing its data and capabilities. The circular economy is no mystery, nor is the identification of what can be reintegrated into the economic cycle something hidden from researchers, nor is there a lack of funding for projects capable of achieving the aforementioned goals. Accordingly, achieving sustainability is the mission of small, simple projects and ideas before large-scale ones

In the following sections of the research, we will attempt to construct the relationships and identify the links necessary to build the vision described above a vision of achieving the dream of sustainable development by utilizing the simplest loop in the circular economy, which is the process of recycling waste and residues to generate competitively valuable outcomes for Algeria's economy.

#### **4.1. The Circular Economy as an Entry Point to Achieving Sustainable Development:**

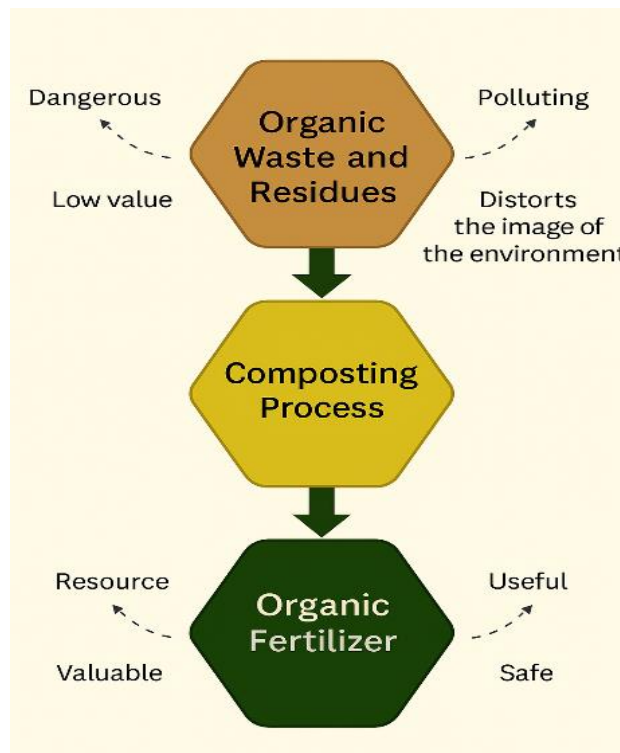
Numerous research studies are rich with methods and classifications for treating and processing waste and residues, as part of efforts to find environmental and economic solutions - and the present study is no exception. As previously mentioned, it is an attempt to create a combination that contributes to achieving sustainable development and finding environmental, economic, and also social solutions.

- Who owns the right to the idea of organic fertilizer (MICHAUD, 2007, p. 05): Everyone writes about organic fertilizer, and in this research, we consider the idea of organic fertilizer in itself to be an added value. It is, in practice, a

process of transforming waste and residues (specifically organic) that constitute a problem and a burden on the economy and society, and a threat to the environment — into a competitive value. Therefore, no one exclusively "owns the right to the idea of organic fertilizer production," as all contributions are efforts by researchers seeking solutions. In no way can one boast about presenting the "idea of utilizing organic fertilizer economically or commercially," since the Chinese preceded us in this more than 500 years B.C.

- Composting and Organic Fertilizer: Countries around the world annually import millions of tons of growing media and soil enhancers. The budget allocated for this task is costly especially for countries that, in the coming years, are betting on achieving a radical transformation in their agricultural and farming sectors, with strategic goals aimed at achieving food security and expanding their agricultural scope. Therefore, it is only logical to consider the circular economy and the management of waste and residue recycling as a starting point for finding solutions. The outcome is extremely appealing - from waste and residues, we generate value.

Figure (3): Organic fertilizer as a value



The source: Prepared by the researchers

Linguistically, Composting is derived from the Latin word *compositum*, which means “mixture” (INSAM, 2007). As for biologists, they define it as: “the biological decomposition of organic materials under controlled aerobic conditions into a stable

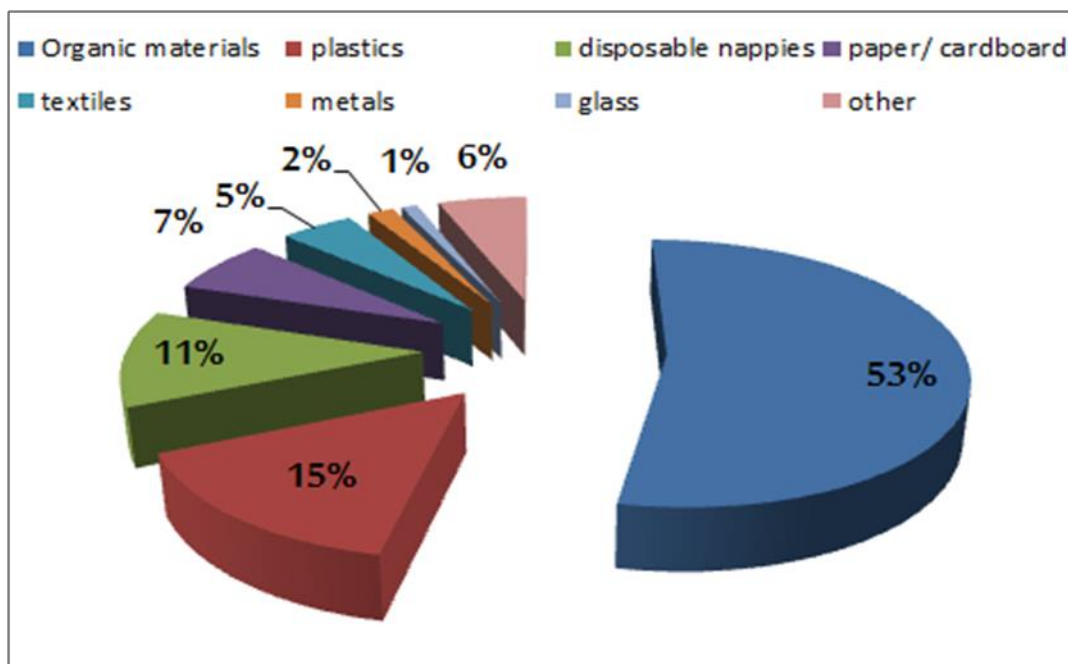
## The role of the circular economy in achieving sustainable development of natural resources (waste treatment and

product resembling humus” (EPSTEIN, 2017, p. 01). Meanwhile, organic compost is defined as: “the product of controlled biological decomposition of organic materials” (CHEN, 2011, p. 513). Accordingly, it can be said that Composting is a monitored method through which organic waste and residues are broken down and destroyed. Once the process is complete, the resulting product is what is known as organic compost.

### 4.2. Composting Culture as a Sustainable Approach:

It would be economically and environmentally beneficial to begin seriously considering the adoption of waste recycling within Algerian society, as every material has an outcome and a value to be gained from it. In this study, we focus on recycling organic waste and residues. Experts estimate that by the year 2035, out of a total exceeding 23 million tons of waste, organic waste will constitute the largest share due to the composition of waste generated from the activities of Algerian society, which stems from its consumption behavior—as illustrated in the following figure:

Figure (4): Types and percentages of household waste and refuse in Algerian society



The source: (Mahfoudh & Belaid, 2023)

The figure above clearly shows that the nature of the Algerian individual’s behavior could provide significant potential for beginning to view composting as a sustainable solution. Organic waste exceeds half of the total waste generated by households and similar sources, as well as other various activities, as shown in the figure. The rate of 53.6% clearly reflects the consumption pattern of Algerian

society, whose nature can be leveraged to establish a sustainable approach especially through the adoption of a circular economy vision.

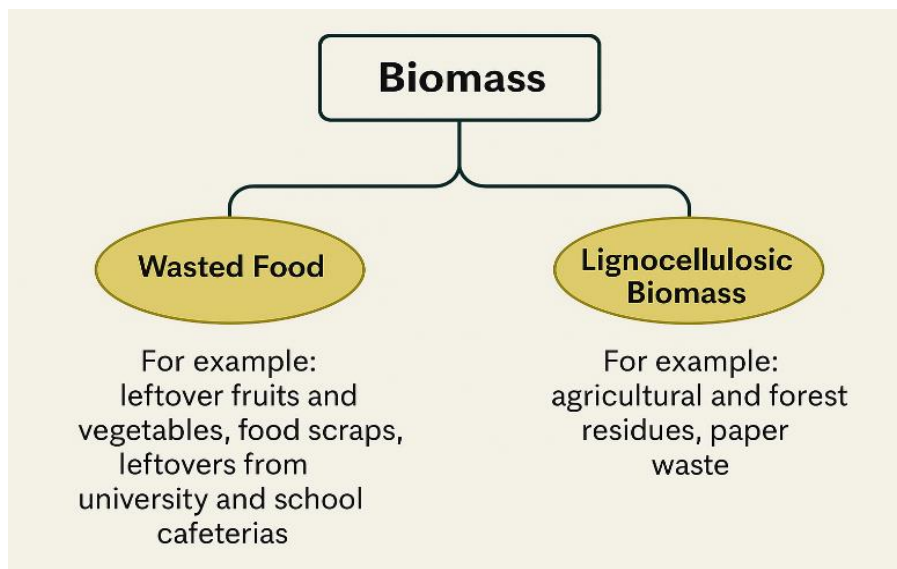
#### 4.3. The Circular Economy and the Utilization of Organic Waste and Residues:

As previously explained, one of the key features of adopting the circular economy vision is building awareness among managers, employees, and citizens around understanding the composition of waste and residues resulting from the economic, commercial, artisanal, agricultural, and other activities of society—based on their categories, physical properties, and chemical composition. This is aimed at utilizing all of this to establish a sustainable societal, economic, and environmental approach.

##### 4.3.1. What do we need?

We view composting as a “technique for managing and also valorizing organic waste.” After studying the properties of these wastes and residues, it becomes possible to determine recycling strategies for each type and category of waste. What concern us in this study are the organic ones. It is worth noting here that the process of identifying organic waste and residues leads to the definition of what specialists refer to as "biomass waste," which allows for determining the most suitable waste types for composting. This biomass waste is categorized as illustrated in the following figure:

Figure (5): The Figure Title



The source: Prepared by the researchers based on (Guihua Yan, 2021, p. 184)

As the figure shows, the diversity in forms and sources of biomass waste and its connection to the structure and density of the population will serve as the foundation for compost production certainly after valorizing, properly managing, and recycling this waste.

##### 4.3.2. The Optimal Recycling Blend for Compost Production

## **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

---

Since composting is, by nature, a biological process par excellence, its workers are fungi, bacteria, worms, and other invertebrates. The human role here is to provide the optimal conditions and the required materials for the process, and to control its experimental parameters to ensure an optimal result. But before that, several points must be emphasized for a better understanding of the valorization of organic waste and residues to create value and achieve sustainability. These include:

### **A. The Need to Understand the (C/N) or (C:N) Ratio... Greens and Browns**

Due to the nature of organic tissues and their varying compositions of carbon (C) and nitrogen (N), microbiological studies have concluded that the optimal composting ratio is (30/1) or (30:1) (THOMPSON, 2007, p. 26). This is the balance ratio; meaning one part of nitrogen-rich sources should be blended with two parts of carbon-rich sources.

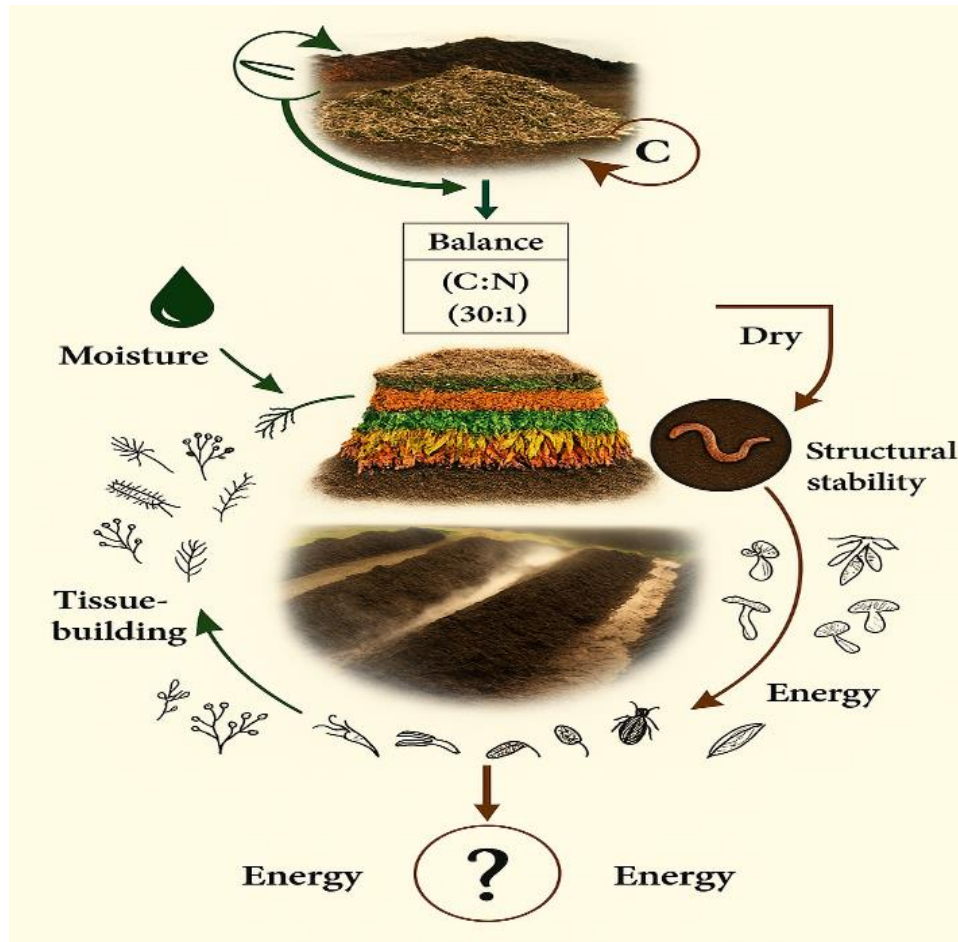
Regarding these sources, two biological terms are introduced (FORD, 2014, pp. 8-9):

- **Brown Waste (Browns):** Includes, but is not limited to: agricultural waste from dead plants and tree leaves, paper waste, straw, untreated wood shavings, shredded paper and newspapers, dry lint, nut shells, tea leaves, and more.
- **Green Waste (Greens):** Includes, but is not limited to: unprocessed food scraps like fruit and vegetable leftovers, algae and seaweed, coffee grounds, up to 10% or slightly less of clay soil, feathers, leather waste and residues, and many more.

It is also permissible to use neutral elements, such as wood ash, eggshells, and others.

Let us not forget the microbial agents involved in composting, especially the most important ones (AGUILAR-PAREDES, 2023, pp. 2-5): Various types of bacteria, fungi, actinomycetes (a group of filamentous fungi-like bacteria), and insects such as earthworms, dung beetles, and others (which will be detailed later).

Figure (6): Integrated dynamic fertilization



The source :Prepared by the researchers based on several references.

Understanding the importance of the balance between Browns and Greens will help the citizen avoid harming the environment and the economy through improper composting. Comprehending this simple detail could push the entire composting culture and process toward wider adoption in society. After all, creating economic and environmental value revolves around the principle that: "Carbon will provide energy, and nitrogen will help build tissues while creating an ideal environment for the work of microorganisms," as illustrated in Figure (6).

#### 4.4. Stages of Value Creation (The Biological Stages of the Composting Process):

In this case, economic value is created as a result of a distinctly biological process; of course, the results are better, faster, and more efficient with proper human supervision and monitoring.

This value creation process is governed by specific characteristics physical, such as temperature and humidity; chemical, such as the concentration levels of elements in the compost pile; and biological, which concern the properties of the microbial, fungal, actinomycete, and insect biological communities.

## The role of the circular economy in achieving sustainable development of natural resources (waste treatment and

Although this process is complex to study, scientists generally agree on the stages and scenarios outlined in the following table, with only minor differences in detail among studies. They agree on the essence of the process as follows:

Table (2): Characteristics and controls of the fertilization process

phases	Temper-ature	Microorganisms	The Function	The results
Mesophilic	(>25°C) 25-50°C	Bacteria: Pseudomonas, Bacillus, Flavobacterium, clostridium, Serratia, Enterobacter and Klebsiella.	Breakdown of carbohydrates, proteins and starch	Ammonia, nitrate, carbon dioxide, polysaccharides, minerals and water.
		Fungi: Alternaria, Cladosporium, Mucor, Aspergillus, Humicola, Penicillium.		
Thermophilic	(>50°C) 50-70°C	Bacteria: Bacillus, Thermus.	Additional disintegration of complex compounds such as cellulose	Ammonia, nitrate, carbon dioxide, minerals, water and humus
		Fungi: Aspergillus, Mucor, Chaetomium, Humicola, Absidia, Sporotrichum, Thermococcus and Yeast		
	70-50°C	Actinomycetes: Streptomyces, Thermoactinomyces and Thermomonospora.	fragmentation of cellulose and lignin	
Cooling / maturation (late mesophilic)	40 °C down to environment temperature	Bacteria: Bacillus, Flavobacterium, Pseudomonas and Cellulomonas.	Mixing organic and mineral ingredients	Compost
		Fungi: alternaria, Aspergillus, Fipolaris and		

		Fusarium.		
		Actinomycetes: Streptomyces and Thermopolyspara.		

The source: Prepared by the researchers based on (Aguilar-Paredes, 2023, pp. 02-05)

Researchers agree that the value intended to be created from a pile of waste that is nearly worthless goes through two main phases:

The bio-oxidative phase ; which includes the Mesophilic, Thermophilic, and Cooling/Maturation (late mesophilic) stages. During this phase, the physical and chemical structure of the pile’s components degrades and decomposes, in the presence of various types of microorganisms and a high temperature that can reach up to 70°C, along with other equally important conditions such as: pH level, aeration, moisture, and the availability of substrates.

It is worth noting that biologically, the temperature needed to eliminate pathogens in waste especially organic waste requires approximately 60°C (INSAM, 2007). The process occurs simultaneously with the absorption of O and release of CO in reasonable amounts needed by the biological process.

This phase is followed by the maturation phase in its second part as shown in the separate part of Table (02), where the pile's temperature starts to drop, accompanied by moistening and stabilization done by the pile managers and monitors. This results in mature organic compost with high-quality humic characteristics; a mature, sanitized, organically rich product, and a highly important element for land reclamation and sustainable agriculture.

### **5-Algeria and the Pursuit of Creating Sustainable Behavior toward the Waste Recycling Process:**

Algeria suffers from a lack of efficient management in handling the waste and residues of all kinds. In addition, there is an almost total absence of serious strategies to implement methods and proposals for adopting a clear approach to waste management and the recycling process in all its forms. However, there are prerequisites and conditions that must be met to achieve sustainability through the adoption of the circular economy as an economic, social, and environmental policy. These include:

#### **5.1.A Law that Values Sustainable Circular Economy Initiatives and Penalizes Violators**

Despite the existence of initiatives and studies by academic researchers and even the relevant ministry, and the existence of legal texts\* that address waste

## **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

management and others that deal with environmental protection\* in detail as well as penalties and financial fines for anyone who disposes of or neglects waste outside its designated location some segments of society do not respond and treat the matter with negligence. The evidence lies in neighborhoods and main streets in major cities suffering from the growing phenomenon of pollution and environmental degradation due to waste. This does not require documented or visual proof; it is what we see and witness daily as Algerian citizens. Accordingly, the discourse of punishment must be intensified, and the reward-based discourse must be valued to put an end to any violations and infractions so that Algerian society takes this issue and all environmental issues seriously.

Therefore, the researcher sees that the first step toward achieving sustainability is the presence of a legal framework and a penal discourse aligned with the mentality of society to punish all violators, whether individuals or institutions, to deter negligent behavior toward the environment. In contrast, the initiatives of individuals and institutions that respect the surroundings, environment, and society must be appreciated. This principle should apply across all fields and policies that the state and relevant ministries are trying to pursue and adopt but are hindered by the absence of legal deterrence in society.

### **5.2. Rethinking Waste Disposal Methods in Algeria**

In conjunction with the economic awakening, Algeria is re-evaluating its methods of managing various types of waste. The quality of a country's economy is not only measured by the volume and diversity of its products or their popularity in foreign markets, but also by its ability to regenerate its resources through the successful adoption of a circular economy where the loss of resources/products tends toward zero.

Accordingly, Algeria is now considering recycling and waste upcycling methods as alternatives to incineration and landfill centers.

#### **5.2.1. Strategy for Organic Fertilizer Farms in Algeria**

In a society that is aware of the economic, social, and environmental benefits of recycling organic waste-and where there are legal penalties for behaviors that contradict sustainable development approaches- landfill and waste incineration centers will be transformed into strategic development projects: for upcycling and recycling, organic fertilizer farms, and even research and development labs. This study is merely a simple addition and an affirmation of the efforts of several concerned entities.

Figure (7): Organic fertilizer compounds/farms



The source : Prepared by the researchers

As illustrated in Figure (07), no sustainable direction can succeed without community effort. Among the behaviors that hinder optimal waste utilization is how individuals as families, economic projects, and institutions deal with the waste generated from their various activities. Therefore, the best starting point in the pursuit of sustainable development is correcting a simple behavior: “the way we handle waste and residues.”

At this stage, it is necessary to implement and generalize waste bins that include clear recycling instructions for various types of waste. This will facilitate the work of sanitation workers and help better regulate individual and institutional behaviors and their duty toward their environment, society, and economy.

From there, a sustainable vision must be adopted for landfills and incineration facilities, which should include:

- Re-engineering these spaces, dividing them, and equipping them with workshops for the proper management of each type and category of waste and residue.

## **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

---

- Attracting engineers and workers with various technical, physical, chemical, biological, and microbiological specialties offering them respectable salaries.
- Including the waste recycling sector among the country's economic sectors and giving it the same attention as other economic fields.
- Opening new academic programs in institutes and universities to train youth in waste recycling in all its forms.

As for the organic waste that is the focus of this study, once it is collected and sent for sorting and classification which, in the beginning, will mostly take place in mixed workshops and facilities before individuals and institutions develop recycling habits and sort their waste into the correct bins as previously mentioned and illustrated in the figure there will be:

- Transportation to compost farms or facilities.
- Sorting of organic waste types into carbon-rich (C), nitrogen-rich (N), and neutral materials, as previously explained.
- Treatment of waste by specialists and preparation for the composting process.
- Consideration of composting process conditions, ensuring it takes place:
  - o In a location far from residential areas.
  - o Near water sources, or equipped with water supply to avoid interruptions.
  - o With available shading and ventilation sources during the composting process—shade to protect the pile from sunlight during summer and from weather fluctuations in other seasons, and ventilation to ensure the aerobic decomposition process proceeds without issues.
- Launching the composting process with the mobilization of all managerial, scientific, and technical expertise, as well as human and material resources, to ensure the optimal execution of the composting operation.
- Monitoring the composting phases through a shift-based system to ensure all conditions for compost creation are met and that value creation is maximized at all physical, chemical, and biological levels including temperature, moisture, aeration, and turning based on the requirements of each stage to ensure the flourishing of the microbial, fungal, actinomycete, and insect biological communities, resulting in a high-quality organic fertilizer.
- Ensuring worker and environmental safety is upheld throughout the process.

### **6-Study Results:**

Researchers agree that sustainability cannot be achieved except by transforming the linear economic model into a circular, renewable, and environmentally friendly economy. Composting is one of the sustainable, environmentally friendly approaches, in addition to its economic and social value;

## VI.1. Organic Composting as an Approach to Achieving Sustainable Development Goals

Its product, organic fertilizer, is defined as (FORD, 2014, pp. 13-14):

- A balanced source of nutrients; as it contains the optimal dose for plant growth due to its richness in (NPK), iron, zinc, and others. This is something commercial and chemical fertilizers lack.
- It improves soil structure; as mixing organic compost with soil increases its efficiency, making it crumbly and allowing air penetration. This increases soil efficiency and agricultural productivity, and helps with smooth surface water drainage.
- It grants the soil the ability to fight pests; it has been proven that compost provides strengthening and fertilizing properties for the soil, combating harmful insects and fungi that cause soil infertility.
- Microbial activity; organic compost provides the conditions for the growth and flourishing of a beneficial insect and microbial community for soil health.

In addition, the organic composting approach and its product organic fertilizer achieves a strong correlation and even realization of the Sustainable Development Goals, which researchers agree upon (CHAUDHARY, 2022, pp. 205-207). The composting approach or the production of organic fertilizers through the recycling of organic waste achieves sustainable development goals as follows:

- It achieves the SDG “Decent Work and Economic Growth” through: Improving the process and efficiency of resource utilization according to the circular model as previously explained, not to mention the quantity and quality of jobs that can be provided; which we can call "green jobs".
- It achieves the SDG “Responsible Consumption and Production” through: Contributing to achieving self-sufficiency and ensuring food security in Algeria. And achieving wheat self-sufficiency, as the organic fertilizer that can be produced will have a great impact and importance in expanding the cultivated areas in the vast South to reach 500,000 hectares; Algeria is striving to become its own food basket.
- It achieves the SDG “Peace, Justice, and Strong Institutions” through: Contributing to reforming environmental and social behaviors and creating and strengthening the responsibility of individuals and institutions towards their environment and society. A clean, socially upright society means a civilized lifestyle, order, awareness, and abundance.
- It achieves the SDG “Reduced Inequalities” through: As mentioned in the previous point; developing responsibility towards the environment and society, and the discipline resulting from adopting and embedding this

## **The role of the circular economy in achieving sustainable development of natural resources (waste treatment and**

---

approach into the nature and character of individuals and institutions will create various forms of synergy and solidarity among the people.

- It achieves the SDG “Affordable and Clean Energy” through: Good management and organization of the waste and residue recycling process, monitoring and optimizing compost production, and relying on local and national expertise to achieve a competitive advantage in the local production of organic fertilizers with high quality and competitive prices.
- It achieves the SDG “Life below Water” through: Achieving the equation of valuing the waste present in the environment; here we mean all types of waste. Recycling waste and reducing its presence in the environment will contribute to preserving the quality and safety of the country's groundwater resources.
- It achieves the SDG “Zero Hunger” through: Contributing to the launch of "green circular agriculture" projects; and transferring the knowledge and experiences gained in composting, land reclamation, and agriculture to simple farmers and ordinary citizens. Reviving the concept of "serving the land": thus, the state will take a step forward in land reclamation and increasing its agricultural capacity.
- It achieves the SDG “No Poverty” through: Creating various job opportunities and promising entrepreneurial opportunities.
- It achieves the SDG “Sustainable Cities and Communities” through: Contributing to raising awareness among citizens about their environment and society and regulating their behavior. Adopting the circular economy model to reuse resources and restore their value without waste. As well as creating value from problems that threaten the economy and endanger the safety of the environment and society.
- It achieves the SDG “Partnerships for the Goals” through: Providing entrepreneurial opportunities between institutions, experts, and even individuals. The idea of composting is not the property of the state and its sectors alone; individuals and institutions are obligated to contribute to the efficient adoption of the circular economy model. Moreover, Algeria today has allies in this field on its soil; most notably: the Chinese partner, a pioneer in recycling and green circular agriculture. And the Italian partner. This composting approach provides not only opportunities for profit and improving the environment and society, but also for learning from experts and specialists.
- It achieves the SDG “Climate Action” through: Replacing the concept of landfills and waste incineration with a more sustainable vision, which is

“compost farms and units”. This not only creates clean energy and resources but also prevents heat emissions and pollution of the air and surroundings.

- It achieves the SDG “Quality Education” through: As mentioned previously; waste recycling practices and organic composting processes in all their stages and types are opportunities to learn more about the essence of this “circular economy.” We have opportunities to implement it, local experts, and foreign experts and specialists with promising experience in the field.

## 7. Referrals and references:

- Aguilar-Paredes, A. (2023). Microbial community in the composting process and its positive impact on the soil biota in sustainable agriculture. *Agronomy*.
- AGUILAR-PAREDES, A. e. (2023). I, Microbialcommunity in the compostingprocess and its positive impact on the soilbiota in sustainable agriculture, *Agronomy*, vol. 13, n° 02, 542, .
- Al-Rumaidi, B. (2018, 12 31). The Circular Economy as an Innovative Approach to Reducing the Environmental Footprint and Achieving Sustainable Tourism Development: A Theoretical and Analytical Study. *Journal of Finance and Business Economics*, pp. 339-355.
- CHEN. (2011). The compostingprocess,Dairy Manure Compost Production and Use in Idaho,.
- EPSTEIN, E. (2017). *The science of composting*. CRC press.
- FORD, t. (2014). ,The perfect compost plan: beginners guide to makinghealthy compost, CreateSpace Independent Publishing Platform.
- Furkan Sariatli. (2017). Linear Economy versus Circular Economy: A comparative and analyzer study for Optimization of Economy for Sustainability. *Visegrad Journal on Bioeconomy and Sustainable Development*.
- Guihua Yan. (2021). *Challenges with Biomass Waste Valorisation*. John Wiley & Sons.
- INSAM, H. a. (2007). *Compost Science and Technology*, Waste Management Series. DIAZ, Luis F.et al.(Eds) .
- Lakhdar, B., & Safia, B. (2019). The circular economy as an entry point for achieving economic superiority in the European Union countries as a model. Assessing the economic and social impact of waste recycling in the context of the pursuit of sustainable development concepts. Setif: Ferhat Abbas University.
- Latifa bekkouch andothers. (2021). Benchmarking in wastewater treatment plants: A tool for measuring the trend towards circular economy. *Strategy and development Review*.
- Mahfoudh, H., & Belaid, A. (2023). Challenges and prospects for activating a circular economy in the context of sustainable waste management in Algeria. Retrieved from *evistaGalega de Economía*: 01-21
- MICHAUD, L. (2007). *Tout sur le compost : le connaître, le faire, l’acheter et l’utiliser*, . CANADA: Éditions MultiMondes, 930 rue Pouliot, Québec.
- Suzy Adly, N. (n.d.). Sustainability of Natural Resources through the Circular Economy. *Journal of Legal and Economic Studies*.
- THOMPSON, K. (2007). *Compost*, DK Publishing, 375 Hudson Street, New York, USA.
- Thong Guan. (2021, 10 21). What Does Closing the Loop Truly Means in the Packaging Context? Retrieved 05 27, 2025, from Thong Guan: <https://www.thongguan.com/what-does-closing-the-loop-truly-means-in-the-packaging-context>