

**Recycling as a Mechanism for Achieving Sustainable Development:
an Evaluation Study of the Public Enterprise for the Management of
Technical Landfill Centers, EPWG CET, in the City of Ghardaia
between 2012-2018**

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Abstract:

This research paper provides an overview of the role of the recycling activity in achieving sustainable development through an evaluation study of Public Enterprise for the Management of Technical landfill Centers, EPWG CET, of the city of Ghardaia, which seeks to value this activity during the period from 2012 to 2018. We have reached a set of results which prove that recycling has an effective role in achieving the economic, social and environmental dimensions of sustainable progress.

Keywords: recycling, waste, Landfill Technical Center , sustainable development.

Jel Classification Codes: L32,Q01,Q57.

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1. INTRODUCTION :

Environmental problems in Algeria increased with the growth and worsening of the waste situation, especially in urban areas, in cities and public places, which led to many environmental and health damages when left without any consideration.

Due to the minimum requirements for environmental safety or appropriate treatment, this scene drew the attention of the authorities, especially after the emergence of the concept of circular economy as an alternative to waste treatment and evaluation by creating wealth in order to achieve sustainable development.

The Public Enterprise for the Management of Technical landfill Centers, EPWG CET, in Ghardaia represents one of the most important mechanisms established by Algeria for the activity of recycling and achieving sustainable and integrated development. In the light of this, we can formulate the following problem:

To what extent does the recycling mechanism contribute to achieving economic, social and environmental benefits in Algeria?

So, we hypothesize that the recycling mechanism contributes to economic, social and environmental benefits in Algeria.

- **STUDY OBJECTIVES:** Through this study, we seek to achieve the following goals:

- Highlight the importance of the recycling mechanism.
- Highlighting the importance of the recycling mechanism in supporting sustainable development.
- Shedding light on the institution of technical waste filling centers and their role in supporting the recycling and sustainable development mechanism.

- **STUDY SIGNIFICANCE:** its importance lies in the world headed towards a circular economy; the imperative of the Algerian economy is heading towards an alternative economy outside of

hydrocarbons; and activating the role of environmental public institutions in activating sustainable development.

- **STUDY METHODOLOGY:** we used the descriptive method in this study with numerous interviews with the institution's managers, and the contractors.

2. Basic Concepts about Recycling Activity:

In this topic, we will discuss a number of concepts related to recycling as follows:

2.1.The Concept of Waste : First, we will review some concepts related to the waste issue .

2.1.1. Definition of Waste: The word waste is always used without distinguishing between the three terms corresponding to the word waste

A-Waste:

- Waste shall mean any substance or object which the holder discards or is required to discard.
- Wastes are substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law (Pongrácz & Veikko, 2004, p. 144).

B-Garbage / Trashes : These are substances that people ignore because of lack of interest and do not include physical, liquid, gaseous or toxic waste. The garbage is sorted, classified into suitable materials and reused (STRASSER, 1999, p. 355) unwanted or (AbdManaf *et.al*, 2009) unusable materials that cannot be reused or recycled.

C- Residue : It is the remnants of the manufacturing process or natural transformation (Naula , Logan, Wong, Barrett, & Burchmore, 2010, p. 230).

Waste is generally known as everything no longer used or intended and should be disposed of. The term certainly applies to discarded materials, but there are specific definitions of waste that affect how waste is organized and must be treated, especially in professional settings.

It has been argued that there are four waste classes (Pongracz *et.al*, 2004, p.64)

- Class 1: Non-wanted things created not intended, or not avoided, with no Purpose.

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- -Class 2: Things that were given a finite Purpose thus destined to become useless after fulfilling it.
- -Class 3: Things with well-defined Purpose, but their Performance ceased being acceptable.
- -Class 4: Things with well-defined Purpose, and acceptable Performance, but their users failed to use them for the intended Purpose.

Accordingly, the waste includes all materials that are no longer of value, whether it is domestic industrial or agricultural. As for waste management, it includes collection, transportation, and treatment of these wastes, and disposing of it in a way that is reused.

2.1.2 TYPES OF WASTE:

Waste is formed from many materials that differ according to the origin of the material and the nature of use (Savage, 2019). It also differs with the disappearance of countries and the stages of human development, and has been classified into several types, which we mention below:

A. Source Classification:

- **Household waste or Residential Source:** It contains some of the products consumed like

compostable material, paper, glass, textiles, plastic, water, in addition to some dangerous chemicals that are constantly increasing, and e-waste (Letcher & Vallero, 2011, p. 54).

- **Commercial waste;** This waste is generated from commercial buildings, shops, offices, hotels, service stations markets and stores, It contains Paper, cardboard, plastics, wood, food wastes, glass, metal wastes ashes, special wastes hazardous wastes (Kreith & Tchobanoglous, 2002, p. 21).

- **Industrial waste:** It is the result of various industrial practices

heavy or light, and requires specific conditions for their management , It is divided into two types.

- **Agricultural waste:** All that results from growing crops and harvesting also includes animal and poultry waste (Langlais, 2002, p. 3).
- **Demolition and construction waste:** One of the main waste streams in many countries , most of the construction wastes produced in the country (Baird, 2016, p. 91). Included both inert and non-inert materials.
- **Mining waste:** Mining-and-quarrying extraction wastes which are barren soils removed from mining and quarrying sites during the preparation for mining and quarrying and do not enter into the dressing and beneficiating processes (Haibina & Zhenlingb, 2010, p. 1338).
- **Municipal Solid Waste (MSW):** As waste from households, as well as any other waste which, because of it nature or composition is similar to waste from households (AbdManaf, AbuSamah, & MohdZ, 2009, p. 2904).

B .Environmental impact:

★ Hazardous waste: Waste that have not been specifically listed may still be considered a hazardous waste if exhibits one of the four characteristics defined as; Ignitability, Corrosively, Reactivity Toxicity (Cheremisinoff, 2002, p. 102).

★ Non-hazardous waste: It is the waste that is collected and treated normally from waste licensed or in processing units, Solid or liquid.

C .Economic impact

- **Damaged Materials:** It consists about the materials which can not be used again due to technological development and the emergence of new alternatives to it, which are represented in some raw materials and some operating requirements or machinery and equipment even if they are usable.
- **Recoverable Materials:** They are remnants of production processes and can be recovered by the organization itself or from other organizations, and it includes raw material residues, process products, and excess material.

D. Physical state:

- Solid waste : It consists of mineral and glass materials resulting from

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household waste Industrial and agricultural, and it takes hundreds of years to decompose in nature.

- Liquid waste : It consists of the use of water in industrial and agricultural processes Also, oils and wastewater that are dumped into the sources of running water are "rivers or seas".

- Gaseous waste : They are gases and fumes that rise from the manufacturing rings to the air. From these gases we find carbon dioxide, sulfur dioxide and nitrogen oxides.

- Special waste: Special waste is any solid waste or combination of solid wastes that due to its quantity concentration, physical or chemical characteristics or, biological properties required special handling and disposal, includes: treated medical waste, dead animals, non-regulated asbestos regulated asbestos, empty pesticide containers, sludge, grease trap waste and grit trap waste (De Rosa, Fay, Keith, Mumtaz, & Pohl, 2017, p. 358).

2.1.3. Waste Management:

The science of waste management is defined as the process of monitoring, collecting, transporting, treating, recycling or disposing of waste. This term is commonly used for waste produced by human activities in order to reduce the negative effects of waste on the environment, health and general appearance (Yacout, Abd El-Kawi, & Hassouna, 2014, p. 183). And the waste management system is now considered important other basic amenities like electricity, airports and highways, and an essential step necessary to treat waste and protect public health (Jha, Sondhi, & Pansare, 2003, p. 1155).

2.2. The Concept of Recycling:

Recycling can be defined from different perspectives:

- Separate a specific waste material (such as glass) from the waste stream and treat it which may be used again as a useful material for products that may or may not be identical to the original products.

- Recycling reduces energy use because making a product from waste material typically requires less energy than fabricating one from raw materials. This, in turn, helps to slash fuel use in manufacturing and helps reduce environmental pollution (Mukherjee, 2013, p. 269).

We conclude from the previous definitions that recycling is a process of recovering and treating waste for the use in new products, through a set of basic stages represented by collecting waste, then recycling it into new materials, next buying and selling it.

2.3. Technical requirements for recycling:

The recycling process is accomplished according to a set of successive steps of a technical context in order to achieve the desired economic and environmental results. Thus, it must be completed according to precise and consecutive steps (Al Razi, 2016, p. 35).

- ✓ **The first step is collection:** There are several methods for collecting recyclables, including curbside collection, drop-off centers, and deposit or refund After collection, recyclables are sent to a recovery facility to be sorted, cleaned and processed into materials that can be used in manufacturing. Recyclables are bought and sold just like raw materials would be, and prices go up and down depending on supply and demand.

- ✓ **The second step is Transport :** It is the main nerve in the recycling process and is implemented in developed countries by means of special cars called waste presses that have multiple boxes according to the type of waste (solid and liquid) and are transported to landfills or to the recycling factory.

- ✓ **The third step is Sorting :** It is the basic stage and the difficult task at the same time, as it determines the difficulty or ease of the recycling process, and this stage is completed in only two ways:

- 1. Manual sorting:** Is used more in developing countries, it depends on the human hand and simple tools.

- 2. Automated sorting:** Which is carried out according to advanced techniques, using mechanical torrents, which are taken by means of magnetic suction or blowing (air) to sort paper and plastic?

- ✓ **The fourth step is Disassembly:** In the Developed countries ‘they

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use robots specializing in the dismantling process, but they remain limited in use due to their cost.

✓ **The fifth step is Cleanliness** : It means the Industrial ecology consistency Who seeks to reduce and benefit from industrial waste.

✓ **The last step is Recycling** : Who seeks to reduce and benefit from several waste.

2.4.Benefits of Recycling: It means the positive impact behind the application of recycling operations, And is represented by the following goals :

- Reduces the amount of waste sent to landfills and incinerators.
- Conserves natural resources such as timber, water and minerals.
- Increases economic security by tapping a domestic source of materials.
- Prevents pollution by reducing the need to collect new raw materials.
- Saves energy.
- Helps create jobs in the recycling and manufacturing industries.

3. Basic concepts of the Sustainable Development :

In this topic, we will discuss about the basic concepts related to sustainable development.

3.1. Definition of sustainable development:

The concept of sustainable development gained great international attention during the seventies

at the United Nations Conference on Human Development in 1972 (Husson, 2011, p. 28) .Where it focused mainly on environmental issues .Among the definitions of sustainable development, we find:

- It was known by the Global Environmental Committee for Development 1987 as;

«It caters to the needs of the present without jeopardizing the needs of future generations" (WIDLOECHER & QUERNE, 2010, p. 13).

-Sustainable development is a development that protects the environment (Klarin, 2018, p. 90).

3.2. Components of sustainable development:

While discussing about sustainable components various criteria have been used for development depending on context and decision-making levels. The ingredients are divided into three components social, economic and environmental .

3.2.1 .Economic components:

- Create opportunities for sales growth.
- Reducing cost through Low input power and raw materials.
- Create additional value.

3.2.2 .Environmental components:

- Reducing waste and emissions in the environment.
- Reducing the impact on human health.
- Use of renewable raw materials.
- Eliminate toxic substances.

3.2.3. Social components:

- Workers health and safety.
- Impact on local communities, quality of life.
- Benefits to disadvantaged groups.

3.3. The Sustainable Development Goals (SDGs):

They were set in 2015 by the United Nations General Assembly and intended to be achieved by the year 2030 are part of UN Resolution 70/1, the 2030 Agenda

- No Poverty.
- Zero Hunger.
- Good Health and Well-being.
- Quality Education.
- Gender Equality.
- Clean Water and Sanitation.
- Affordable and Clean Energy.
- Decent Work and Economic Growth.
- Industry, Innovation and Infrastructure.
- Reducing Inequality.

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- Sustainable Cities and Communities.
- Responsible Consumption and Production.
- Climate Action.
- Life below Water.
- Life on Land.
- Peace, Justice, and Strong Institutions.
- Partnerships for the Goals (Duran *et.al*, 2015, p. 809).

4. Study Of Public Enterprise For The Management Of Technical Landfill Centers in Ghardaia "EPWG CET" Between 2012-2018:

4.1.A Look At The "EPWG CET": To learn more about the extent of the recycling mechanism's contribution to achieving sustainable development, we will conduct an evaluation study for the EPWG CET.

4.1.1 Enterprise functions: Its primary function are:

- Overseeing household waste and municipal Solid Waste (MSW) reception centers.
- Pick the right waste for recycling.
- Sale of returnable and valid waste.
- Recovering wastes with modern technologies.

4.1.2. The Activity of Landfill Centers: It has three main activities:

- The first activity:** The process of treating waste and recovering materials that can be reused through the sorting process. There are two methods of sorting:
 - Manual waste sorting.
 - Sorting by sorting center.
- The second activity:** It is a process of compressing and packing the daily waste and cover it with soil to reduce the odor emissions.
- The third activity:** Protect the environment by controlling polluted water, collecting emissions and reducing fires and smoke.

4.1.3. Classification of Landfill Centers: They are classified into three categories:

The first class: For hazardous waste

The second class: For household and similar waste, which we will reside in our study.

The third class: special waste.

4.2. Evaluation Activities In The "EPWG CET":

4.2.2. Stages Of Waste Recovery In The Establishment :

We must provide methods for waste recovery, which is limited to the following stages:

The first stage: Take a sample of the waste loaded on the truck upon arrival, to monitor its nature and quality.

The second stage : Direct the truck towards the meter to estimate the amount of waste received at the center.

The Third stage: Dumping loaded waste, Sorting of waste by contractors for reuse.

The Fourth stage: Simplify and settle the waste by a special truck.

The Fifth stage: Compacting process.

The sixth stage: Retrieve the LIXIVIATS.

4.2.3. The Capabilities Of The EPWG CET:

According to the table N° 01 in the appendices, shows the number of landfill centers in the establishment which are tree 03 landfills centers on probation , and three 03 modern landfills controlled, according to the provisions of Law 19-01 issued on 12/12/2001 related to waste management, control and removal, waste which is not allowed, to enter the center are :

- Hazardous waste.
- Wastes from health-care *activities*.
- Chemicals.
- Laboratory waste.
- Radioactive waste.
- Toxic waste.
- Explosive waste and fuel or flammable.

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- Hazardous liquid waste.
- Tires used.
- Huge waste.
- construction waste.

4.2.4.The Quantities Of Waste Received By The" EPWG CET":

The volume of waste is constantly increasing where the volume of waste in the year 2012 was 26,995 tons; it jumped twice in 2014, at 54,923.3 tons .Then to an increase of 4% in the year 2018 (see figure N°01 in the appendix) estimated at 72490.7 tons.

And this is due to several reasons including:

- Providing new Landfills Centers over these years, as the waste has been previously unloaded randomly, without regard to public health conditions.
- The growth of population density and the increase in urban neighborhoods which are one of the main factors affecting the increase of waste.
- The government's contribution to enacting deterrence laws and by the Environmental Gendarmerie to enforce environmental protection.

4.2.5. The Percentage of Waste Recovery from the " EPWG CET":

The recycling process for sorting recyclable materials represents the nerve core of the waste pusher activity, such as recovering carton, plastic and glass, with the aim of preserving the environment. This process is authorized for the contracting parties with the establishment , which are seven 07 private recyclers , and they use the landfill in exchange for a specifications, however, the recovery rate decreased, given the amount of waste received by the centers(see figure N°02 in the appendix). This is due to several factors, among which we mention:

- Lack of labor, which was mostly African.
- Importing raw materials at competitive prices.
- There are no local or national markets to sell the materials that were collected from the centers.
- The lack of investors in the recycle activity.

4.3.Type Of Waste Recovered In 2018:

There are many materials retrieved from the centers, including copper, iron, plastic ,paper, aluminium ,PET(Polyethylene terephthalate) which is the most recovered (see figure N°03 in the appendix) this is due to:

- It is widely available among household waste.
- Easy to recycle.
- National markets provide for disposal of this substance in Batna, Oran and Algiers.
- It is considered as a profitable item through its high selling price, in view of other materials.

5. Conclusion:

We draw from our study a set of findings and recommendations, represented in the role of recycling activity in the achieving of the sustainable development through:

- **Achieving the Environmental Sustainable Development:**

- Protecting citizens from diseases and epidemics.
- Reducing the production of CO2.
- Keep riches from disappearing.
- Reducing groundwater pollution.
- Create green spaces after the centers are finished.

- **Achieving the social sustainable development:**

- Building good relationships with society, including individuals, associations, institutions, and consolidating trust between all.
- Spreading a culture of environmental conservation and sustainability;
- Promoting voluntary campaigns for hygiene.

- **Achieving Sustainable Development Economic:**

- Creating direct and indirect jobs.
- Encourage investors to go towards recycling.
- Recover the largest possible quantity of waste.
- It contributes to raising the efficiency of the recycling sector.
- It contributes to building a circular economy based on scientific and administrative bases.
- Exploiting BIOGAZ.

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• Recommendations:

- Opening the sorting lab to facilitate the sorting process.
- Organizing the open doors to present the Foundation's activities and bring it closer to the citizen.
- Encouraging investors to work in these pieces Via (ENSEJ, CNAC...).
- Investing in bringing modern technology and successful foreign expertise.
- Creating a communication and information exchange platform between various parties contractors, investors and stakeholders in order to promote this sector and make full use of it.

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7. Appendices:

Table 1.CAPABILITIES OF THE "EPWG CET" From 2011 To 2018.

	Area / m2	Capacity / tons	Daily reception price t / day	Estimated duration of exploitation / year
T.L.C* BOUHRAOUA	160000	151412	120	03
T.L.C METLILI	100000	60 000	17	20
T.L.C EL- GOLEA	167000	114000	13	17
L.C BERRIANE	100000	75000	18	17
L.C EL GURRARA	100000	75000	20	17
L.C ZELFANA	34375	48000	09	20
I.L.C BOUHRAOUA	7000	151412	120	24

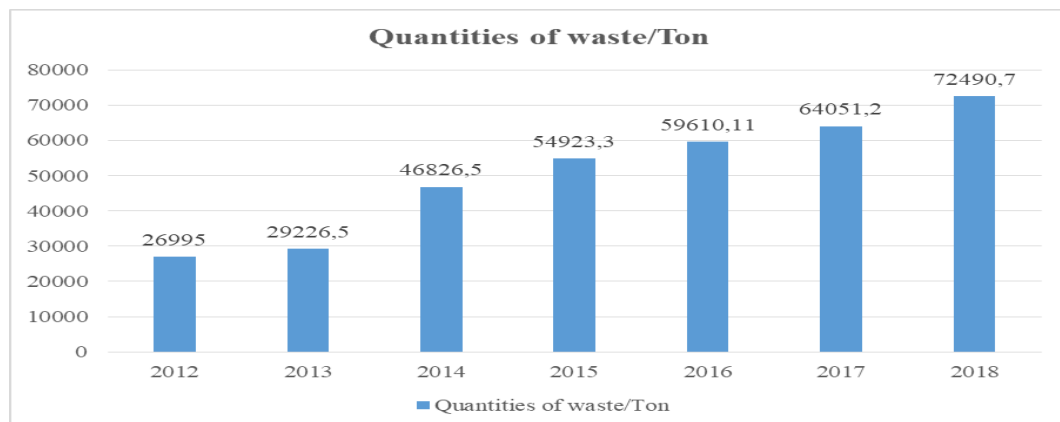
*T.L.F: TECHNICAL LANDFILL CENTER

*L: LANDFILL CENTER

*I.L.C : INERT LANDFILL CENTER

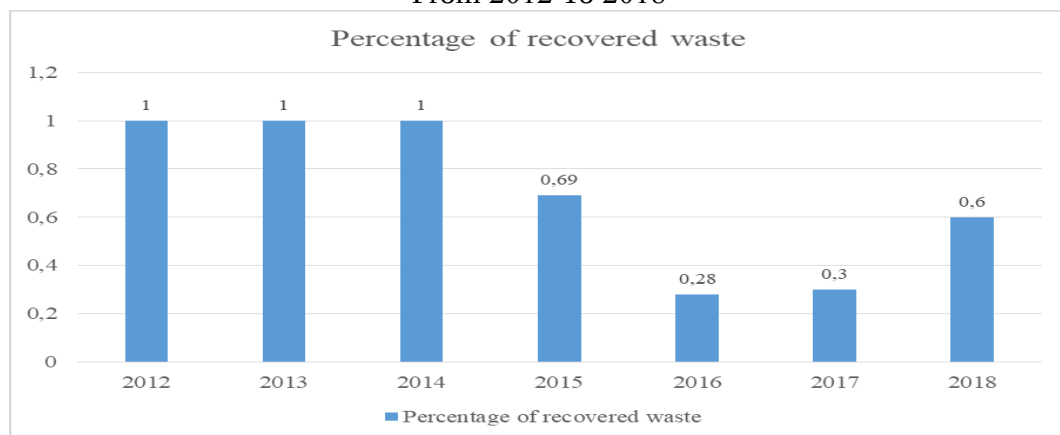
Source: From The Establishment Documents,2019.

Fig.1. THE QUANTITIES OF WASTE RECEIVED BY " EPWG CET" From 2011 To 2018



Source: From The Establishment Documents,2019.

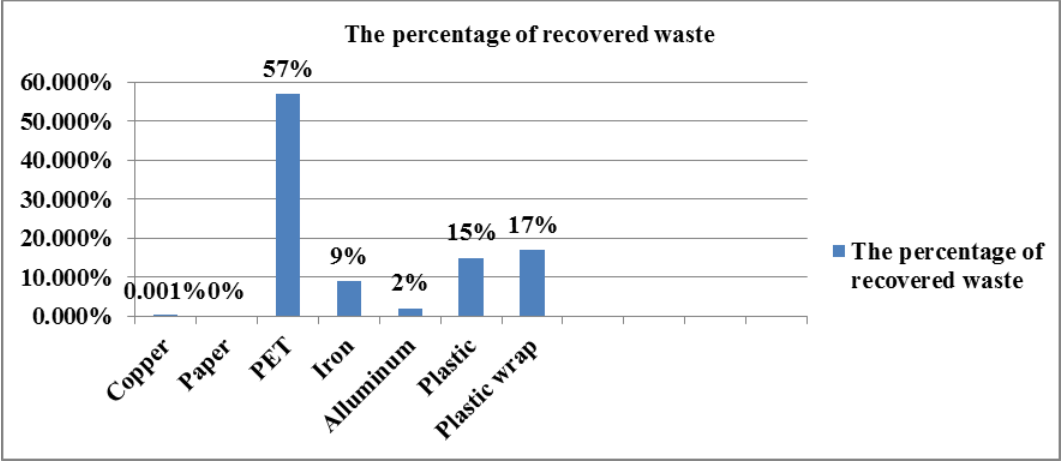
Fig.2. THE PERCENTAGE OF WASTE RECOVERED FROM "EPWG CET" From 2012 To 2018



Source: From The Establishment Documents,2019.

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Fig.2. THE MOST RECOVERED MATERIAL FROM "EPWG CET" In 2018



Source: From the establishment documents,2019.