

Household and Similar Waste Management Between the Requirements of Legal Environmental Protection and the Imperatives of Sustainable Development

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Abstract:

This study addresses the issue of household and similar waste management within the framework of reconciling the requirements of legal environmental protection and the imperatives of sustainable development. It highlights the transformation of the concept of waste from merely valueless materials to an economic resource that can be valorized, and reviews the Algerian legislative framework governing this field, particularly Laws 01-19 and 25-02, and the modern principles they include such as extended producer responsibility and the circular economy.

The study shows the role of sustainable management in consolidating environmental protection principles, particularly prevention, precaution, the polluter pays principle, and participation. It also explains the main mechanisms for material and energy recovery of waste, enhancing economic efficiency and contributing to resource sustainability.

It concludes that sustainable waste management constitutes a dual tool for achieving environmental protection and supporting the national economy, while emphasizing the need to develop management mechanisms, strengthen investment, and environmental awareness.

Keywords: Sustainable waste management – Household and similar waste – Investment – Circular economy – Environmental protection principles

Introduction:

Human beings naturally aspire to live in a healthy environment free from various forms of pollution, as they are an active element within it, influencing and being influenced by it at the same time. The surrounding environment is the closest sphere with which humans interact, which requires its protection from all sources of pollution. Household and similar waste is among the most widespread pollutants in the world, representing a real threat to the environment, humans, and animals alike.

Approaches related to household waste vary according to the adopted perspective—social, economic, or environmental—which has also influenced its terminology and content. While waste was previously considered valueless material and a source of pollution, this concept has radically changed, as waste has become a raw material that can be valorized and economically exploited, achieving a balance between developmental and environmental objectives and contributing to the sustainability of natural resources through rational and sustainable management.

Based on this vision, Algeria, like many countries, has adopted an integrated legal and regulatory framework to accompany these changes within sustainable development. It has issued several laws enshrining key principles such as the “polluter pays” principle, waste reduction and valorization, planning integration, and the adoption of circular and green economy mechanisms, allowing a gradual transition from fossil energy dependence to renewable energies. This requires advanced techniques in collection, sorting, recycling, recovery, and treatment, in order to eliminate traditional practices of random dumping of household and similar waste.

Environmental challenges such as resource depletion, biodiversity loss, climate change, and global warming have led Algeria to join international conventions and adopt national legislation, notably Law 03-10 on environmental protection within sustainable development, and Law 01-19 on waste management, control, and disposal, amended and supplemented by Law 25-02.

Law 25-02 clearly reflects the legislator’s orientation toward modern concepts such as integrated waste management, eco-design, anaerobic digestion, energy recovery, circular economy, extended producer responsibility, and end-of-waste status.

The objective is a dual effectiveness: environmental protection and economic efficiency through waste valorization and transformation into a resource supporting the national economy, in line with the Rio 1992 Conference and Agenda 21, as well as the Basel Convention of 1989. From the above, the following question can be raised:

- How does sustainable management of household and similar waste contribute to balancing legal environmental protection and sustainable development requirements?

To answer this question, the study is divided into two axes.

Chapter One: Conceptual Framework of Sustainable Management of Household and Similar Waste

First: Definition of Household and Similar Waste

1. Terminological definition

Waste in general is defined as materials of zero economic value from the perspective of its owner or producer. It has also been defined as movable and abandoned objects that their owner wishes to dispose of properly and legally in order to protect public health. Household and similar waste has been defined by the Algerian Ministry of Spatial Planning and Environment as all waste generated by households along with waste from craft and commercial activities, which can be collected and treated without resorting to special techniques. [1]

Robert Gillet, UN expert, defines it as heterogeneous residues produced in homes such as food scraps, newspapers, and items placed in containers for municipal collection, in addition to administrative, market, trader, and craft waste, and abandoned objects on sidewalks. [2]

2. Legal definition

French law defines waste as residues of production, transformation, or use, or abandoned property. Moroccan law defines household waste as household residues, and similar waste as industrial or commercial waste similar in nature and composition. [3]

Algerian legislation defines waste in Article 89 of Law 83-03 (repealed) as anything resulting from production, transformation, or use that is discarded or abandoned. It is also defined in Article 3 of Law 01-19 as any material or object that the owner disposes of or is required to dispose of. [4]

From these provisions we conclude: [5]

- The Algerian legislator did not depart from the general concept of waste found in Law 83-03 (repealed), and added the notion of owner or holder, expanding it beyond

voluntary abandonment to include mandatory disposal. This corresponds to French Law 75-663 of 15/07/1975, which defines waste similarly. [6]

Michel Prieur notes that this law underwent more than 18 amendments, and the concept of waste was later aligned with EU law under the ordinance of 17/12/2010 and Article 541(1) of the French Environmental Code. [7]

- Article 3 of Law 01-19 aligns with the French Environmental Code definition of waste. [8]
- The legislator did not include valorization in the definition, focusing only on disposal and elimination, excluding the economic dimension of sustainable development, unlike Egyptian Law 202/2020, which includes recycling. [9]

3. Economic definition

Waste is any material whose economic value is zero or negative for its owner. [10]

Characteristics of household waste

a. Chemical reactivity

Household waste interacts with soil, water, and air, causing pollution and affecting ecosystems.

b. Transformation into fertilizers

Through composting, organic waste is converted into fertilizer using microorganisms.

c. Recycling

Waste can be reused through physical and chemical recycling within the circular economy.

Second: Definition of sustainable management of household waste

Definition of sustainability:

Some define it as “the way of achieving growth that takes into account and considers human aspects in all their dimensions, economic, social and ethical, and this cannot be achieved without eliminating all forms of imbalance and disparities, whether within the same society, i.e. between its different groups, or between the countries of the North and the South, or between different generations.” [11]

From this definition, it can be inferred that sustainability has several types:

- **Environmental sustainability:** It is “a development approach that inevitably leads to the protection of natural resources necessary to ensure human protection such as water, air, land and biodiversity, so that they are not significantly degraded through pollution, carbon dioxide accumulation, depletion of the ozone layer, and destruction of natural

habitats that ensure biodiversity, through combating pollution, reducing energy consumption, and protecting non-renewable resources.” [12]

- **Economic sustainability:** It means “protecting and ensuring productive capacities from one generation to another, and enabling society to achieve unlimited development, whether in its technical and technological aspect or in its ability to ensure increasing income levels from one generation to another.” [13]
- **Social sustainability:** It means “the ability to provide resources and rights that allow human beings to ensure well-being in life, such as access to basic needs of food, health, education, and housing, as well as access to goods and services, whether material or intangible, and participation in political life and protection of their rights. Achieving this sustainability requires internal cohesion within society and ensuring a harmonious social fabric away from tensions and political, economic, and ecological conflicts that increase inequality.” [14]

Sustainability in its environmental, economic, and social sense means moving from the necessity of providing for present needs without considering future continuity, as it is not possible to meet all the needs of current generations and neglect the right of future generations to obtain, for example, a clean environment, economic development, or an acceptable social level ensuring a dignified life.

2- Definition of sustainable management of household and similar waste:

The Arab Forum for Environment and Development (AFED) defines sustainable management of solid waste as: “dealing with waste as resources that must be recovered through a series of interconnected and integrated loops involving successive stages (full life cycle). These stages begin at the source generation stage (where waste quantity, quality, and hazard can be reduced), followed by internal storage, then collection from different sources and transportation to suitable sites for temporary storage or treatment, then the possibility of recycling and recovery of recoverable materials, and finally safe environmentally sound disposal.” [15]

Solid urban waste management is also defined as: “the full ability to control waste from the moment it is disposed of by its owner until its treatment and final disposal in ways and methods that ensure the proper functioning of this process in order to eliminate negative environmental impacts resulting from such waste.” [16]

Regarding Algerian legislation, waste management is defined in Law 01-19 on waste management, control and elimination as: “all operations related to waste collection, sorting,

transport, storage, valorization, and elimination, including the monitoring of these operations.” [17]

From this definition, it is noted that the Algerian legislator did not provide a conceptual definition of waste management, but rather listed its operations. From the perspective of sound environmental management of waste, as stated in the Basel Convention and the Rio Conference 1992, this definition remains incomplete, especially since waste management, including household and similar waste, aims at rational and ecological management, requiring a change in consumption and unsustainable production patterns, as well as achieving harmony between development and environmental protection, which is not included in the Algerian legislator’s definition. Waste management is not only operational procedures that end random disposal practices, but is an integral part of sound environmental management and contributes to effective environmental protection.

Chapter Two: Sustainable management of household and similar waste between the consolidation of legal principles of environmental protection and the achievement of economic efficiency

We will address in this axis sustainable management of household and similar waste as a tool to consolidate legal principles of environmental protection (first), then as a tool to achieve economic efficiency (second).

First: Sustainable management of household and similar waste as a tool to consolidate legal principles of environmental protection

Sustainable management of household and similar waste consolidates the principles contained in Law No. 03-10 on environmental protection within sustainable development. Legal principles are defined as “preventive and deterrent measures provided for by law, implemented by environmental protection bodies through various mechanisms.” [18]

Thus, legal principles form the general framework of protection, which sustainable waste management seeks to implement as a priority.

1- Sustainable management and natural protection principles

A.Principle of biodiversity conservation:

Sustainable management of household and similar waste contributes to biodiversity conservation by requiring all waste-related activities to respect it, especially waste treatment facilities. It prevents any activity that threatens protected areas or harms ecosystems. [19]

B- Principle of non-degradation of natural resources:

Sustainable waste management reduces pressure on fossil resources, promotes renewable energy sources derived from organic waste, and helps combat global warming and ozone depletion by reducing uncontrolled burning. The legislator also introduced ecological design under Article 02 of Law 25-02 to reduce environmental impacts throughout product life cycles. [20]

2- Sustainable management and preventive technical principles

A- Principle of preventive action and correction at source:

Environmental law is preventive in nature. This principle strengthens protection by requiring the use of best available techniques at reasonable cost. Sustainable waste management consolidates this principle through selective sorting, rational treatment, and environmentally safe disposal. The Algerian legislator also emphasized waste prevention and reduction at source in Law 01-19 and Law 25-02. [21]

Thus, adopting sustainable waste management helps avoid the harmful effects of these materials on human health and the environment and prevents them. Household waste and similar waste is a reality, and its sustainable management is the preventive mechanism for it.

b- The precautionary principle:

The jurists KOURILYSK Philipe and VINEY Genevière define the precautionary principle as: «the taking of a decision by public or private persons that includes measures relating to an activity or a product which is believed to potentially constitute a risk and cause harm to public health, to the safety of present or future generations, to consumers and even to the environment" [22]

As for the Algerian legislator, it did not explicitly define the precautionary principle but mentioned the basis of its application, considering that: "the unavailability of techniques due to current scientific and technical knowledge does not constitute a reason for delaying the adoption of necessary and appropriate measures to prevent the risk of serious environmental harm, provided that this is done at an acceptable economic cost." [23]

The precautionary principle is based on three main elements:

- Absence of scientific certainty: which means that the absence of full or absolute scientific certainty or conclusive scientific evidence is not a reason for not taking precautionary measures. Once there is hesitation or doubt about a suspected risk, even if it is not scientifically proven, all precautionary measures must be taken[24]

- Possibility of serious and irreversible harm: this means that it does not concern any risk whatsoever as some claim, but it is mainly directed at serious risks or those that are irreversible. Therefore, the precautionary principle requires following a set of procedures for risk assessment: monitoring, scientific studies, and surveillance or observation[25]
- Necessity of immediate action: meaning the need to take appropriate measures to address damages, where public authorities intervene to apply it under risk management, thus anticipating what may happen in the future. [26]

From the above, it can be considered that sustainable management of household and similar waste is a true embodiment of the precautionary principle, as it represents protection of the environment in general, including humans who belong to the biological environment according to the classification adopted in the Stockholm Conference of 1972. It places both the environment and humans above all considerations, leaving no room for delay in the presence of imminent danger. For example, sustainable management of household and similar waste aims at removing uncontrolled dumping sites that may cause diseases or unknown viruses. Thus, sustainable waste management is based on the precautionary principle from the outset, applying all immediate measures to combat pollution.

3- Sustainable management of household and similar waste and deterrent technical principles

a- The substitution principle:

In order to ensure effective environmental protection, the substitution principle has been adopted as a basis for environmental protection, which consists in replacing any activity harmful to the environment with another that is less dangerous, so that the least risky activity is chosen even if its cost is high, as long as it is for environmental protection [27]

The implementation of the substitution principle in the management of household and similar waste contributes to environmental protection by replacing environmentally unsafe disposal methods with safe methods. Examples include replacing the burning of plastic and paper with recycling, and replacing the burial of organic materials with composting, and replacing the discharge of wastewater into seas with its treatment for use in various activities.

In line with this, the legislator explicitly stipulated in Law 25-02 amending Law 01-19 the necessity of gradually replacing the use of single-use plastic products.

b- The polluter pays principle:

The polluter pays principle is defined as: “that principle which establishes the responsibility of the polluter for compensating the damages resulting from his activity. The operator who causes environmental damage bears the responsibility for repairing this damage or bears the costs related to the measures taken by the public authority to ensure that the environment is in an acceptable condition, whether preventive costs related to pollution prevention” [28].

The forms of the polluter pays principle appear through various ecological fees and levies imposed on polluting activities, which as a whole constitute taxes known as environmental tax, or pollution tax, or Pigouvian tax, named after Arthur Cecil Pigou who proposed it in the early twentieth century and called for the imposition of environmental taxation [29].

In the field of waste, the European Community, following recommendations of the European Council, defined the content of the principle through a series of directives giving it legal force. It issued a directive on 25/01/1975 confirming that: “the costs of waste disposal are borne by the waste generator, producer or manufacturer, and not by the taxpayer or consumer, in application of the polluter pays principle” [30].

Therefore, green or ecological taxes are among the most important modern measures adopted by the legislator to protect the environment, including the tax on household waste collection.

In addition, the legislator under Law 25-02 amending Law 01-19 introduced a new contribution imposed on any producer or market operator called “eco-contribution”, and also strengthened this by establishing a new type of responsibility, namely extended producer responsibility, which imposes financial obligations on producers regarding the products they manufacture or market.

4- Sustainable management of household and similar waste and participatory principles

a- The integration principle:

It was enshrined by the legislator in Law 03-10, as this principle provides that environmental protection and sustainable development require arrangements that must be integrated when preparing and implementing sectoral plans and programs [31]

This principle appears in waste management through the national hazardous waste management plan and the municipal household waste management plan, as well as the national program for municipal solid waste management initiated by the Ministry of Spatial Planning and Environment as an integrated and gradual approach aimed at eliminating uncontrolled dumping sites and organizing waste collection, transport and disposal within environmental protection requirements.

Planning in the field of household and similar waste allows the involvement of all citizens in the preparation of municipal waste management plans [32], and this importance of planning was reinforced in Law 25-02 amending Law 01-19 through the provincial integrated waste management plan for household and similar waste and inert waste, in addition to the national integrated waste management plan.

The legislator did well in adopting the gradual planning approach, as it did not limit itself to the municipal plan as the sole mechanism for waste management as in Law 01-19, but involved the wali, the Ministry of Environment, the Ministry of Interior, local authorities and urban planning in waste management directly, since most municipalities were unable to manage household and similar waste in a sustainable manner.

b- The information and participation principle:

The principle of participation and information is one of the most important principles on which environmental protection is based. It is one of the essential guarantees for activating social control in environmental matters, as it establishes fundamental rights such as the right to request environmental information and the right to participate in decision-making. Awareness and participation make individuals aware of all violations affecting the environment.

This principle was clearly enshrined in the Rio de Janeiro Conference of 1992 through Principle 10, which states: “Environmental issues are best handled with the participation of all concerned citizens, at the appropriate level. At the national level, every individual shall have appropriate access to information concerning the environment held by public authorities, including information on hazardous materials and activities in the community. Each individual shall also have the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available and ensuring effective access to judicial and administrative proceedings, including redress and remedy.” [33]

The principle of information and participation means that every person has the right to know the state of the environment, since it belongs to everyone and cannot be monopolized by any party. Participation means the right of individuals to take part in environmental decision-making. It is the framework that embodies environmental partnership by involving individuals in everything related to the environment. The legislator therefore considered individuals and associations in environmental protection as instruments of environmental management. Thus, civil society in all its components contributes to decision-making related to regulating

household and similar waste management operations, knowing their fate and disposal methods, and identifying polluted sites and activities.

Second: Sustainable management of household and similar waste as a tool to achieve economic efficiency

Sustainable management of household and similar waste is both an environmental treatment and an economic treatment, as it operates in a dual manner: it ensures environmental protection on one hand and supports the national economy through its valorization on the other.

Therefore, achieving economic efficiency through sustainable management of household and similar waste is reflected in what is called valorization, which was provided for by the legislator in Law 01-19 and further emphasized in Law 25-02 amending Law 01-19. Thus, we will first address the concept of valorization, then its forms.

1- Definition of valorization:

Valorization is defined as: “all operations aimed at reusing waste, recycling it or composting it. Recycling is defined as reuse or recovery, i.e., the material valorization of waste, such as recycling glass and plastic, as waste treatment through physical and chemical methods allowing return to raw materials with or without transformations and integrating these materials into the production cycle” [34].

The legislator defined it in Article 02 of Law 01-19 as: “all operations aimed at reusing waste, recycling it or composting it.” However, in Law 25-02, the legislator used new terms in defining valorization, defining it as: “all operations aimed at re-employing waste, repairing it, reusing it, preparing for reuse, recycling it, composting it and/or anaerobic digestion or any other operation aimed at obtaining from waste usable materials or energy.” [35]

It can be noted that the definition in Law 25-02 reinforces one of the principles of Law 01-19, as Article 02 provides for waste valorization through reuse, recycling or any method allowing the production of reusable materials or energy from waste [36] and added new terms that remain within the framework of material or energy valorization of waste, which will be addressed in the forms of waste valorization.

2- Forms of valorization of household and similar waste

The legislator distinguished between two types of valorization: material valorization and energy valorization.

a- Material valorization of household and similar waste

The material recovery of waste was not defined by the legislator in itself; however, its methods were mentioned, namely: reuse, repair, preparation for reuse, recycling, composting, and anaerobic digestion [37]

These are, in their entirety, primarily economic concepts that significantly contribute to consolidating the sustainable management of household waste and similar waste (HWSW). Therefore, each term will be explained while highlighting the importance of these processes in achieving the economic dimension.

- **Reuse:** The legislator defined it as: “any operation through which materials or products that are not classified as waste are reused for a use identical to the one for which they were designed” [37]. It is worth noting that Law 01-19 did not include this term. From this definition, reuse does not rely on any manufacturing, transformation, or repair process; instead, items are reused in their original condition as if they were not waste.
- **Repair:** Any operation involving the repair of damaged items that are no longer usable in order to reuse them again [38]. From this definition, repair requires intervention processes because the materials are originally damaged and unfit for use, thus requiring restoration to become usable again.
- **Reuse or preparation for reuse:** The legislator defined it as: “any operation of inspection, cleaning, or repair through which waste is reused again” [39]. It also means: “using a product either for the same purpose or for other purposes without the need for reprocessing, and it is considered a better method because it uses the same material without returning to the manufacturing stage, which requires additional energy” [40]. In other words, it is the use of waste for purposes different from its original function. This method reduces waste quantities and saves money and energy. Examples include using plastic bottles as plant pots, as well as transforming rubber tires into decorative objects for the environment.
- **Recycling:** The legislator defined it as: “any operation involving several stages starting from waste collection and its transformation into raw materials resulting from recycling, then integrating them into the manufacture of new products” [41]. It is also referred to as “recycling (Le Recyclage), meaning waste treatment through physical and chemical methods that allow the recovery of raw materials with or without transformation and their integration into the production cycle through remanufacturing” [42]. It also refers to the process of converting separated solid waste into raw materials for the production of new products, which may be similar or different from the original products.

- **Composting:** The legislator defined it as: “any method of aerobic transformation of fermentable material under controlled conditions” [43]. It is also defined as: “a set of processes applied to raw household waste to produce a compound called compost, which generally has the properties of humus” [44]. Composting (Compostage) falls under biological treatment, being a controlled biological process that converts organic waste into fertilizer that enriches the soil through microorganisms present in the soil. Producing quality compost requires selective collection of organic waste at the source from households, green spaces, and some industries, transported separately from other waste to composting sites. Examples of organic waste include food scraps, uncolored kitchen paper, and green waste. It contributes to improving and fertilizing soil.
- **Anaerobic digestion:** The legislator defined it as: “any method of anaerobic transformation of fermentable materials under controlled conditions” [45]. Here, it is noted that the legislator included anaerobic digestion under material recovery; however, in reality, this technique falls under non-thermal energy recovery technologies for HWSW waste, which will be explained later.

B- Energy recovery of household and similar waste

Unlike material recovery, the legislator defined energy recovery under Law 25-02 amending Law 01-19 as: “any recovery operation based on the use of the thermal potential of waste through its incineration and the recovery of this energy in the form of heat or electricity” [46]. From this definition, it can be concluded that household and similar waste can become a source of energy generation and an investment opportunity within the so-called green economy, especially after developed countries succeeded in converting it into electrical and thermal energy, thus making it a form of sustainable management.

Before addressing the forms of energy recovery, it is necessary to define energy.

- Definition and types of energy:

- **Energy definition:** It is a physical quantity manifested in the form of heat, mechanical motion, or binding energy within the atomic nucleus between protons and neutrons. It represents forces capable of performing work and is an abstract entity known only through its transformations.
- **Types of energy:**
- **Conventional energy:** Also called non-renewable energy, it includes coal, oil, minerals, natural gas, and chemical materials. It is exhaustible because it cannot be

replaced in a short time and will eventually deplete due to intensive use. It exists in limited quantities in nature and is environmentally polluting.

- **Renewable energy:** Defined as a set of diverse supply chains whose use does not lead to depletion of the primary resource, and which can be renewed. Examples include wind energy, solar energy (photovoltaic and thermal), geothermal energy, hydropower (water, tidal energy), and biomass (fuel and biological decomposition).

It is also defined as energy produced from natural, theoretically unlimited sources, contributing to environmental protection and sustainable development.

It is worth noting that the Kyoto Protocol of 1997, ratified by Algeria under Presidential Decree 04-144, emphasized the need to increase the use of new and renewable energy systems, addressing waste management from the perspective of energy recovery, such as methane recovery to combat greenhouse gas emissions and energy recovery from waste.

The legislator defined renewable energy under Article 03 of Law 04-09 on the promotion of renewable energy in the framework of sustainable development as: “forms of electrical, kinetic, heat, or gaseous energy obtained from solar radiation, wind power, geothermal heat, organic waste, hydropower, and biomass technologies...” [47] It was also defined under Article 02 of Executive Decree 17-98 as: “all energy derived from hydraulic sources, solar thermal energy, wind energy, geothermal energy, solar radiation, biomass, as well as waste recovery” [48].

From these definitions, it is clear that the legislator only listed energy sources rather than defining renewable energy itself, including organic waste as a source of renewable energy, consistent with Article 02 of Law 01-19 which allows energy recovery through any method.

However, Law 25-02 limited energy recovery to incineration only, whereas HWSW waste can be converted into energy through technologies producing electricity, heat, or fuel.

- Methods of energy recovery from household waste:

- **Incineration (energy recovery):** Defined as “the combustion of organic materials such as waste with energy recovery” [49]. It is a thermal process carried out in specialized furnaces that completely break down waste into simple substances (NA, CO₂, H₂O) under high temperature and oxygen.

Uncontrolled open burning causes severe air pollution; therefore, the legislator adopted safe incineration in specialized facilities for waste treatment.

- Non-thermal energy recovery techniques:

This includes anaerobic digestion, aerobic digestion, and landfill recovery.

- **Anaerobic digestion:** Based on decomposition of organic matter by anaerobic bacteria in the absence of oxygen, producing biogas, which can replace natural gas and reduce

greenhouse gases. It also helps reduce methane emissions and eliminate pathogens, while protecting groundwater and surface water. For example, Algiers produces over 3000 tons of waste daily, potentially generating 130 m³ of biogas per ton.

The legislator included anaerobic digestion under the circular economy, defined as: “a set of economic and social activities based on eco-design, repair, reuse, recycling, composting, and anaerobic digestion aimed at reducing resource use and environmental damage” [50].

However, this technique actually falls under the green economy, which focuses on renewable energy, green construction, clean transport, water management, wastewater recycling, and land management.

- **Aerobic digestion (fermentation):** Based on aerobic bacteria that decompose biomass in the presence of oxygen, producing ethanol and other products. Fermentation raises temperatures up to 65°C or more.
- **Landfill recovery (technical landfill):** Landfills can be a source of energy through methane recovery from decomposing waste, producing biogas used as fuel.

- Impacts of energy recovery from HWSW:

Energy recovery is a process that uses combustible waste to produce energy through incineration or other recovery methods. Household waste becomes a source of electricity, heat, or fuel.

Thermal recovery allows energy generation from waste with calorific values ranging between 700–2000 kcal/ton, producing heat used in heating systems. Japan treats 40 million tons of municipal waste annually using thermal methods, ranking first globally.

Electricity generation from waste uses advanced incineration technologies, producing steam used for electricity production. For example, England operates a plant treating 200,000 tons annually, producing 38 MW of electricity, enough for 80,000 homes.

Conclusion:

Through this study, it becomes clear that household and similar waste has become a major subject in legal, economic, and social studies, especially as it has become an important resource for achieving economic efficiency through recovery, while also ensuring environmental protection and sustainability.

The realization of sustainable management of household waste and similar waste requires several factors to ensure its implementation, including combating the alarming spread of uncontrolled dumpsites, as well as the random dumping of household waste and similar waste

without valorization, and stopping all forms of environmental pollution caused by the negative impacts of household waste.

Therefore, sustainable management of household waste and similar waste requires the State to encourage individuals and institutions to invest in this field in order to develop what is known as the circular economy, i.e., waste recycling, which constitutes a qualitative support for the national economy in light of the rising prices of raw materials, as well as investing in it as a form of renewable energy through its energy and thermal recovery. On the other hand, waste management also contributes significantly to environmental protection, especially since household waste, if not properly controlled, represents an ongoing threat to the environment in general and to human health in particular.

Accordingly, we propose the following measures to address this imbalance:

- Adding the economic dimension to the definition provided for waste in Article 03 of Law 01-19, as a new perspective, along with issuing regulatory decrees governing investment in the fields of the circular economy and green economy.
- Developing waste management mechanisms in a way that generates significant additional financial resources for the State, and encouraging the private sector to invest in recycling projects, while providing them with the necessary incentives and facilitations.
- Combating all forms of uncontrolled burning in open spaces, and replacing them with organized incineration methods within waste treatment facilities equipped with systems and technologies that prevent the release of toxic substances and chemicals, and using them for electricity generation.
- The need to activate the role of individuals and associations in consolidating sustainable household waste management, as they are considered environmental management tools under Law 03-10, along with intensifying awareness and educational campaigns, as well as providing incentives for households that practice waste sorting at the source, and giving greater attention to sanitation engineers as a cornerstone of efficiency.
- The necessity of consolidating international principles of sound waste management, which require encouraging selective sorting at the source and valorizing household waste instead of landfilling as a disposal mechanism, as well as providing all necessary means, particularly the generalization of specialized, buried, and smart bins.
- Activating strict environmental administrative control in the field of household waste management by local authorities in order to combat all illegal activities due to their negative impacts on health and the environment.

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