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The Management of Special and Hazardous Waste in Algeria: The Case of the Company Greensky

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Abstract:
This article aims to highlight the reality of the management of special and dangerous waste in Algeria. Taking as a practical case the GREENSKY company specializing in the collection, transport, elimination and treatment of special and dangerous industrial waste. This study contributes to the understanding of current waste management practices in accordance with regulations, and to the identification of ways of improvement to protect the environment and public health, by presenting the technologies and know-how of a leading company in special and dangerous waste management in Algeria.
Keywords: Green sky, Special waste, Special dangerous waste, Special dangerous waste management.
Jel Classification Codes : Q53 ; Q59

Introduction:

The management of special and hazardous industrial waste has become a major concern in Algeria due to the increasing volumes of waste and the need for effective management to reduce impacts on the environment and public health. In response to this situation, and in order to minimize environmental and health risks, a more rigorous and rational approach to the management of industrial waste is required from all concerned stakeholders (industrial companies, the state, and waste management companies).

Industrial companies often turn to specialists for the management of their special and hazardous waste, who provide comprehensive services including collection, treatment, and recovery of these wastes, while ensuring compliance with environmental regulations.

The aim of this article is to highlight the reality of special and hazardous waste management in Algeria, using the company GREENSKY as a practical case, which specializes in the collection, transport, disposal, and treatment of special and hazardous industrial waste.

The importance of this article is emphasized by its contribution to understanding current waste management practices and identifying potential improvements to protect the environment and public health. Based on the above, we pose the following question:

Is the management of special and hazardous waste in Algeria in compliance with environmental regulations?

To answer this question, our methodological approach is based on a case study of the GREENSKY company, a special and hazardous waste management firm, after presenting and discussing the regulatory framework for waste management in relation to environmental protection within the context of sustainable development.

II- Theoretical Framework for the Management of Special and Hazardous Waste (SHW):

1- Definition of SHW:

According to the World Health Organization (WHO), hazardous waste refers to waste that possesses physical, chemical, or biological characteristics requiring special handling and disposal processes to avoid any risks to health and/or harmful effects on the environment. These characteristics include: (WHO, 1984)

a) An acute short-term risk, such as acute toxicity through ingestion, inhalation, or skin absorption, corrosiveness or risk from eye or skin contact, or a fire or explosion hazard; or

b) Long-term risks to the environment, including chronic toxicity from repeated exposure, carcinogenicity (which, in some cases, may result from acute exposure but with a long latency period); resistance to detoxification methods such as biodegradation; the potential danger of polluting surface or groundwater; or properties causing sensory nuisances, such as unpleasant odors.

Hazardous waste comes from various sources, including industrial, agricultural, medical-hospital, petrochemical, domestic, and others. The quantity and characteristics of these wastes vary depending on the source and technology used. (UNEP, 2004)

Algeria has 923,000 classified businesses, including 77,000 industrial companies and 900 public and private hospital establishments, all generating special and hazardous waste. During an information day on this type of waste, the head of the special and hazardous waste department at AND (National Agency for Waste Management), Ms. Assia Haddar, highlighted that battery waste, used oils, tires, and electronic devices are among the main special and hazardous wastes. According to data presented during this study day, a total of 325,000 tons of special and hazardous waste is recorded annually in Algeria. (APS, 2022)

Algerian law on waste management provides a comprehensive definition of different types of waste, including special waste, which comes from various industries such as industrial, agricultural, medical, and service sectors. It also includes waste from activities that require special treatment due to the nature and composition of the materials they contain. Additionally, special hazardous waste is a subset of special waste that poses a risk to public health and/or the environment due to the harmful substances they may contain. (JORA, Law 01-19 of December 12, 2001, on waste management, control, and disposal, 2001)

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2- Characteristics of SHW:

In Executive Decree No. 06-104 of February 28, 2006, the criteria for the danger classification of SHW can be found. The identification of hazards is based on the use of product safety data sheets and the use of warning pictograms or hazard statements, as illustrated in the following table:

Table 1: International Hazard Symbols

Source: Andry Brunning (2015):Aguide to chemical Hazard Symbols on:
https://www.compoundchem.com/2015/05/19/hazard-symbols/amp/

3- Regulatory Framework for the Management of Special Hazardous Waste:

The economic and industrial development that Algeria is experiencing, along with its new dynamics, has led to the emergence of new industrial activities, in addition to the development of older ones, particularly in transformation industries such as the petrochemical, automotive, heavy industry, pharmaceutical, energy, agri-food, healthcare, and water treatment sectors.

All these industrial activities, in their manufacturing and/or service processes, generate recyclable, special, or special hazardous waste. The management of these wastes must be subject to specific and professional handling in accordance with the current national regulations (Law 01-19) as well as safety and environmental standards.

Waste management involves all operations related to the collection, sorting, transport, storage, recovery, and disposal of waste, including the control of these operations (AND, management of healthcare waste: national guide, 2019).

Environmental activities related to the management of all types of waste, particularly hazardous waste, are highly regulated worldwide. Environmental concerns in Algeria are historic, starting with its participation in the first World Conference in Stockholm in 1972 under the auspices of the United Nations. The law **No. 83-03 of February 5, 1983**, concerning environmental protection, followed by the introduction of a modern legal framework in the early 2000s, has provided a solid regulatory foundation for all activities related to environmental protection. (Bouadam, 2022)

Since 2001, the Algerian government has defined a national strategy for environmental protection, which was translated into the National Action Plan for the Environment and Sustainable Development (PNAE-DD).

Regarding waste management, the PNAE-DD is divided into two programs: (AND, National Action Plan for the Environment and Sustainable Development, 2024)

- **Progdem**: Program for the management of municipal solid waste,
- **Pnagdes**: National plan for the management of special waste.

In this context, the government launched a comprehensive upgrading program, particularly through:

- **Strengthening regulatory aspects**: Enactment of Law 01-19 of December 12, 2001, concerning waste management, control, and disposal.
- **Institutional strengthening**: Through the creation of institutions dedicated to all environmental themes. This led to the creation of the National Waste Agency (AND). Its main mission is to promote integrated waste management.
- **Decentralized services**: 48 environmental directorates at the wilaya level and regional inspections.
- **Introduction of environmental taxation**: Specifically, the household waste removal tax (TEOM) and the tax on polluting and hazardous activities (TAPD).

We will next identify the various laws and regulations corresponding to environmental standards, especially concerning the management of special hazardous waste:

a- Regulations for the Collection and Transportation of SHW:

Algeria has adopted a series of measures in the field of Special Waste Management, based on precaution, prevention, and the organization of different collection and treatment methods. The regulation for managing healthcare waste is governed by Law **01-19 of December 12, 2001,** titled: "Management, control, and disposal of waste" (JORA, Law 01-19 of December 12, 2001, on waste management, control, and disposal, 2001).

Regarding collection, the law emphasizes the need for organized and efficient collection systems. Any natural or legal person wishing to engage in the collection of special waste must meet the requirements set forth by Executive Decree **No. 09-19 of January 20, 2009,** and must obtain authorization granted by a decision from the Minister in charge of the environment, which is valid for a period of 5 years (JORA, Executive Decree **No. 09-19 of January 20, 2009**, 2009).

Executive Decree **No. 04-409 of 2 Dhou El Kaada 1425,** corresponding to **December 14, 2004**, set out the conditions for the transport of special hazardous waste. According to **Articles 04, 05, and 06** of this decree, hazardous special waste being transported must be contained in packaging that takes into account their nature, state, and danger. For each category of hazardous special waste, a joint order from the ministers responsible for the environment and transportation sets out the types of packaging that can be used, specifying the characteristics of its impermeability and resistance to pressure, vibrations, shocks, heat, and humidity. Packaging for hazardous special waste must bear readable and indelible labels identifying the hazardous waste it contains. The technical characteristics of the labels for hazardous special waste are set by a joint order from the ministers responsible for the environment and transportation (JORA, Executive Decree No. 04-409 of 2 Dhou El Kaada 1425, corresponding to December 14, 2004, 2004).

The transportation of hazardous special waste requires authorization in accordance with the provisions of Article 24 of Law **No. 01-19 of 27 Ramadan 1422, corresponding to December 12, 200**1. This authorization certifies that the transporter is authorized to carry hazardous special waste, accompanied by a document known as **the "hazardous special waste movement document,"** which allows for verification of:

- The conformity of the transport with the current regulations and legislation;
- The regularity of interventions by each operator and, if applicable, the refusal of any operator to perform their assigned task;
- The compliance with the general conditions for the transport process, particularly regarding the route and timing (JORA, Executive Decree No. 04-409 of 2 Dhou El Kaada 1425, corresponding to December 14, 2004, 2004).

Products listed as hazardous materials are classified into thirteen classes, each defining the primary danger they present: (INRA, 2002)

1. Explosive materials and objects, with 6 divisions: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6 and 13 compatibility groups (A, B, C, D, E, F, G, H, J, K, L, N, S)
2. Gases divided into 9 groups based on the hazardous properties they present (A, O, F, T, TF, TC, TO, TFC, TOC)
3. Flammable liquids 4.1 Flammable solid materials 4.2 Materials prone to spontaneous combustion 4.3 Materials that release flammable gases when in contact with water 5.1 Combustible materials 5.2 Organic peroxides 6.1 Toxic materials 6.2 Infectious materials
4. Radioactive materials divided into 13 forms based on their characteristics and packaging
5. Corrosive materials
6. Various dangerous materials and objects

The products are identified by their UN (United Nations) code, name, classification class, and a classification code. The UN code (also called the material code) is an international 4-digit identification number (which will also be noted on the product's packaging).

Regarding Class 2, gases are assigned to one of the following groups (based on their hazardous properties):

- A: Asphyxiant
- O: Combustible
- F: Flammable
- T: Toxic
- TF: Toxic, flammable
- TC: Toxic, corrosive
- TO: Toxic, combustible
- TFC: Toxic, flammable, corrosive
- TOC: Toxic, combustible, corrosive

Executive Decree **No. 04-410 of Dhou El Kaada 1425, corresponding to December 14, 2004,** sets the general rules for the establishment and operation of waste treatment facilities and the conditions for admitting waste into these facilities.

b- Regulations for the Treatment of SHW:

The treatment of waste begins with sorting, which can be done at the source or after collection. Sorting at the source involves setting up a waste separation system based on their type, at the very location where they are produced. It directs each type of waste to the appropriate disposal stream, in suitable packaging. It ensures the safety of people and controls the risks, in compliance with hygiene rules. It also helps reduce disposal costs. (AND, management of healthcare waste: national guide, 2019). Sorting waste by its nature is also encouraged to facilitate the separation of recyclable materials from non-recyclable waste.

According to **Article 11 of Law 01-19,** the recovery and/or disposal of waste must be carried out in conditions that comply with environmental standards, particularly without: (JORA, Law 01-19 of December 12, 2001, on the management, control, and disposal of waste, 2001) — endangering the health of people, animals, and without constituting risks to water resources, soil, or air, nor to fauna and flora; — causing discomfort from noise or odors; — harming landscapes and sites of particular interest."

Articles 12, 13, and 14: Establish a national plan for the management of special waste. **Articles 15 and 16**: "Special waste must be treated in authorized facilities, at the expense of the generator and/or holder, either individually or in association with approved entities."

Executive Decree **No. 07-144 of May 19, 2007,** sets the nomenclature for classified installations for environmental protection; it defines the conditions governing the establishment of treatment facilities. (JORA, Executive Decree No. 07-144 of May 19, 2007, 2007)

The foundation of this text is Law **No. 03-10 of July 19, 2003,** concerning environmental protection within the framework of sustainable development. (JORA, Law No. 03-10 of July 19, 2003, 2003)

According to **Article 02** of this decree, the nomenclature for classified installations for environmental protection is a classification that includes: A. The allocation of a four-digit section number, structured as follows: — The first digit represents the substance used or the activity. — The second digit represents the category of danger (very toxic, toxic, flammable, combustible, explosive, corrosive, and combustible) or the branch of activity. The first two digits represent the type of activity. B. The designation of the activity of the classified installation C. The identification of the authorization or declaration regime, in accordance with the provisions of Executive Decree No. 06-198 of May 31, 2006 D. The determination of the display radius of the classified installation E. The documents to be attached, namely: Environmental impact study, hazard study, environmental impact notice, and report on hazardous products.

SHW requires special treatment, usually incineration, and standardization with a lot of technology and expertise. Incineration is currently the only proven method for treating waste that allows for the recovery of the full energy content of the waste (RECORD, 2015).

III. Waste Management by the Company GEENSKY:

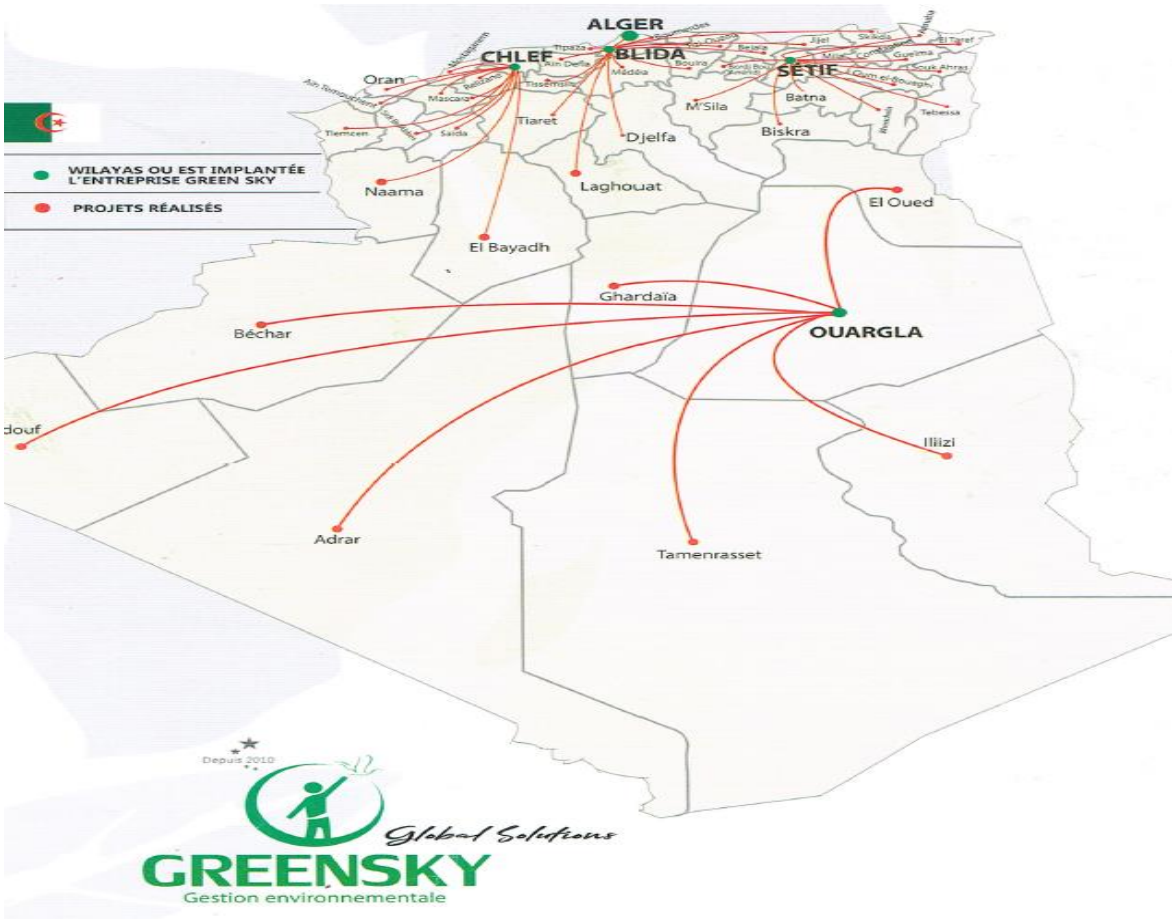
1- **Company Overview**: SARL GREEN SKY is an Algerian company specializing in the collection, packaging and preparation, transportation, pretreatment, and treatment of special and hazardous waste since 2010. Certified by the **ISO 9001:2015 standard**, the company offers complete solutions nationwide for the management of:

- In-situ industrial waste management or delegated management
- Collection and logistics
- Preparation and packaging of industrial and special waste
- Site decontamination
- Waste disposal and treatment

- Chemical analysis

Established 13 years ago, Green Sky now has 4 sites, including the one in Chlef, which houses the largest incinerator in Algeria, the one in Blida, which hosts the headquarters and a medical waste treatment unit that processes 10 tons of hospital waste per day, as well as Hassi Messaoud and Sétif, which serve as waste collection centers. Green Sky has carried out various missions throughout the country, as illustrated in the following figure:

Figure n°2: GreenSky's locations and completed projects.



Source: Internal Documents of the Company

Operating in a sector where regulatory compliance is a primary prerequisite for all activities, GREEN SKY holds a series of approvals and authorizations that allow it to provide solutions in accordance with Algerian regulations and environmental standards:

- Authorized collector for the transport and collection of special and hazardous waste throughout the national territory.
- Interministerial authorizations for the incineration treatment of industrial waste such as chemical waste, hazardous sludge, paints, resins, etc.
- Interministerial authorizations for the treatment of healthcare and pharmaceutical waste.

- Export of hazardous waste through its own DZ number.

The company, which started with a team of about ten people, now employs 160 full-time staff members across logistics, technical, commercial, and administrative departments.

2. Waste Collection and Transport at GREEN SKY:

To meet the regulatory, environmental, and safety requirements of its clients, GREEN SKY offers solutions ranging from simple waste collection for businesses to the management of all waste streams for optimal waste management. Drawing on its experience, GREEN SKY provides tailored collection solutions, including support and dedicated services after assessing clients' needs.

Depending on the activity of the companies and the nature of the waste produced, GREEN SKY implements collection systems designed for industrial, chemical, pharmaceutical, and healthcare waste, ensuring compliance with current laws and regulations, through various solutions:

- Provision of containers: rolling bins, skips, approved packaging for the transport of hazardous waste, etc.
- Tailoring collection methods to the type of hazardous waste.
- Administrative and operational management: monthly reports and periodic assessments.
- Setting up waste consolidation areas and internal waste disposal sites.
- Installation of waste reduction tools on-site: compactors, shredders, balers, etc.

GREEN SKY ensures that all necessary documentation is provided to its clients, confirming the traceability of their waste from preparation and collection to transport and treatment.

The company offers clients the means to transport all types of waste both nationally and internationally, while adhering to applicable standards and regulations to ensure operational safety. To prevent accidents during transport, GREEN SKY ensures all required conditions are met, conducting operations with transparency and professional rigor. This includes services such as escort transport and other dedicated services based on specific needs.

Waste storage on-site is regulated, as it can pose a health and safety risk to staff and the environment. To secure the operations of waste storage and handling, GREEN SKY provides packaging and re-packaging services for industrial and chemical waste, reducing the risk of accidents on-site while remaining compliant with hazardous waste storage regulations. This ensures the following benefits:

- Simplified in-situ management and budget control.
- Regular reporting.
- Continuous improvement focus.
- Ability to refocus on core activities.

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3. Waste Treatment by GREEN SKY:

The company has its own physico-chemical and microbiological analysis laboratory, which is essential for waste characterization. This allows for:

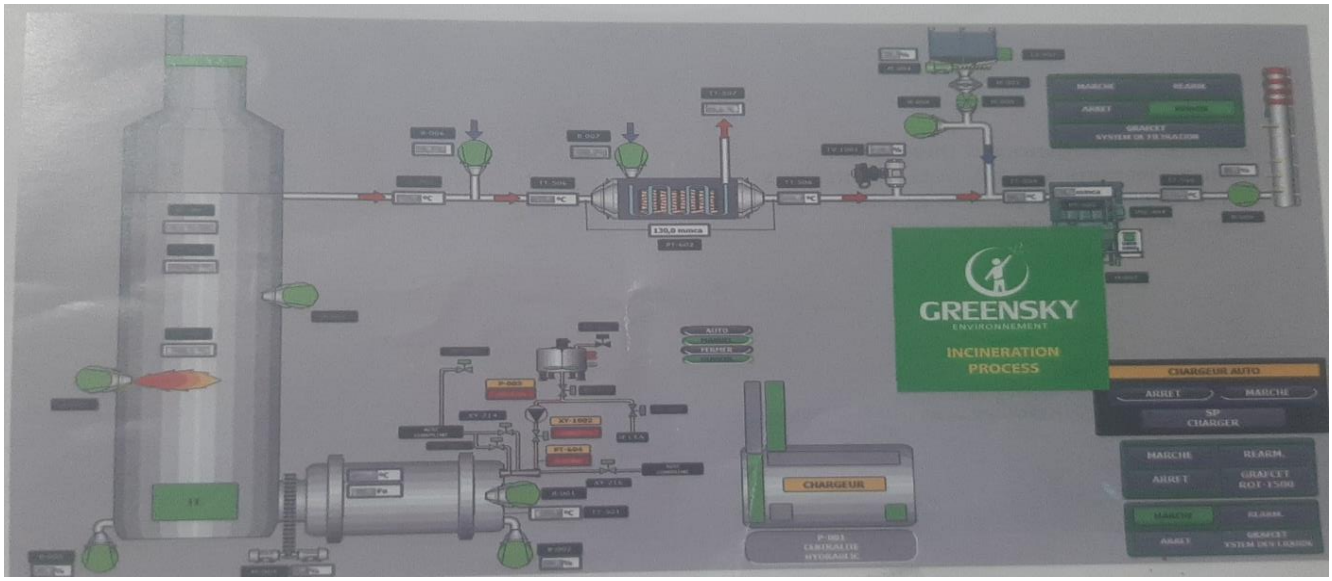
- Identifying the disposal stream.
- Identifying the risks associated with handling, such as during re-packaging or dismantling operations.
- Developing a treatment solution tailored to the issue at hand.
- Gathering all relevant information concerning the waste in question.

The treatment of waste after collection and transport is a key focal point in the management of special waste.

As a professional and reputable player in the local market, GREEN SKY has several outlets for the treatment and valorization of waste:

a. Incineration and neutralization of industrial waste: Inaugurated in 2018 in Chlef, the company operates the first rotary drum incineration plant for industrial waste, with a treatment capacity of 6,000 tons of industrial waste per year. It has obtained the required approvals from both the Ministries of Environment and Health. The plant is designed for the treatment of hazardous waste at very high temperatures, ensuring an environmentally friendly and eco-responsible incineration process. It features a dry filtration system specifically designed for gas filtration, as illustrated in the following figure:

Figure 3: GREEN SKY's incineration system.



Source: Internal Document of the Company

Many industrial discharges contain substances such as alkalis or acids that require neutralization before final treatment. In partnership with LAFARGE HOLCIM, Green Sky offers waste management services for treatment through the cement industry process.

Additional sites will be opened in various regions of the country to increase the capacity for waste collection, treatment, and even incineration. It is specified that the company has a fleet of trucks and vans that collect waste from clients and transport it to Chlef. While not the only players in the field in Algeria, Green Sky can still take pride in having its own incinerator, whereas its competitors rely on cement plants to incinerate their waste.

b. Medical Waste Sterilization: Healthcare waste is generated from diagnostic activities, monitoring, and preventive, curative, or palliative treatment in human and veterinary medicine, as well as from laboratories, research centers, and educational institutions. Some waste presents an infectious risk, such as Infectious Risk Healthcare Waste (DASRI), while others may pose chemical, toxic, or radioactive risks. To meet the needs of healthcare professionals, Green Sky operates a hospital waste treatment station that uses disinfection to manage healthcare waste safely.

c. Site Decontamination: Site decontamination involves identifying sources of soil or facility contamination due to accidents involving hazardous substances such as chemicals, oils, hydrocarbons, or materials used during construction. As a specialist in waste management, Green Sky offers decontamination services, covering the entire process, including collection, transport, and safe disposal.

IV. Conclusion:

The management of special and hazardous industrial waste has become a major concern in Algeria. In the face of increasing waste volumes and the need for effective management to reduce environmental and public health impacts, a more rigorous and rational approach to managing special and hazardous waste is required from all stakeholders involved.

The study of the company GREEN SKY has highlighted the current reality of special and hazardous waste management (DSD) in Algeria, which is characterized by:

- The provision of tailored collection solutions, as well as dedicated support and services.
- The use of suitable means for the transportation of all types of waste, both nationally and internationally, in compliance with current standards and regulations, ensuring the safety of operations.
- A packaging and re-packaging service for industrial and chemical waste to avoid any risk of accidents on-site, always in compliance with hazardous waste storage regulations.
- The availability of a rotary drum incineration plant for industrial waste.
- The presence of a physico-chemical and microbiological analysis laboratory essential for waste characterization.
- Several companies (presented in the annex) have trusted GREEN SKY to manage their waste.

Although progress has been made, further improvements are necessary to ensure full compliance with environmental regulations and to protect the environment and public health in the long term.

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