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The Reduce of CO_2 Emissions in Morocco: Case Study in A Landfill

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Abstract

In a global context increasingly concerned with climate change, understanding the impact of economic growth on the environment is becoming crucial, especially for developing countries. Morocco has been committed to the United Nations Framework Convention on Climate Change (UNFCCC) to achieve the objectives set for reducing greenhouse gas (GHG) emissions by 13% by 2030, with 2010 as the reference year. Such a target could reach 32% by the same horizon under certain technical, financial and capacity building support conditions.

The main emitters of greenhouse gases (CH4 and CO2) are landfills because during the decomposition of solid waste CO2 is the most present gas pollutant is for this reason focuses this case study carried out in a landfill located in Fez, the development of a new calculation method or we could have a reduction in CO2 41261,69 teq CO2/year and with a yield of 85%.

Keywords: CO2 emissions, landfill, Green House Gas (GHG), Climate, Building

1. INTRODUCTION

Global warming is an environmental problem that attracts the attention of all companies in the different sectors of activity. Their concerns about the environmental problems lead them to a reform of the mode of management.

The Fez landfill represents a successful model of energy recovery from waste and the contribution to the production of electricity from renewable energies. The total capacity of the bioelectric plant can reach 5 MW and produce 40 000 MWh / year.

The total capacity of the landfill this year is 26000 MWh / year for a power of 3 megawatts. The company has installed two biogas collection systems, a 525 Nm3 / h with drawal station, flares, and other equipment. In order to start the process of methanation that, through the biological degradation of organic matter, to recover the biogas resulting from this operation and convert it into electrical energy.

Biogas is a renewable energy source with many social and environmental benefits. It comes from the anaerobic fermentation of organic matter, it is composed mainly of methane and carbon dioxide, usually saturated with water vapor. It also [1] contains at low concentrations other fermentation-derived gases such as hydrogen sulphide, hydrogen, silicone. In addition to biogas, the fermentation of solid waste produces leachate, which is a toxic liquid from the degradation of waste. Biogas energy recovery ensures renewable energy production that reduces fossil fuel consumption**.**

In this paper, we will present a method for calculating CO2 emissions in a landfill proposed by the clean mechanism project.

2. GENERAL CONTEXT ON GREENHOUSE GAS

2.1 Clean Development Mechanism (CDM) for different country

The CDM was created as a tool, a flexibility mechanism, of the Kyoto Protocol. The CDM fulfils the twin roles [2] of providing flexibility to Parties included in meeting their quantified emission

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limitation and reduction commitments under the Kyoto Protocol and of assisting developing [3] countries in achieving their sustainable development goals.
The opportunity created under the CDM for project participants to earn a saleable credit for each tonne of greenhouse gases (GHGs) they [4] reduce or avoid has catalysed the registration of more than 8100 projects and action plan in 111 countries and has led to the issuance of more than 1.9 billion CERs.

2.2 Morocco's objectives in the conference of the parties

After a COP 21 of "decisions" in Paris in 2015, there was a real momentum that generated an unprecedented global mobilization on the way to achieving the Paris Agreement's objective of limiting the rise in the Earth's average temperature to well below 2°C and as close as possible to 1.5°C.
COP 22 in Marrakech was certainly the COP of "action" on climate change. This is how it was promoted, even wanted by Morocco, and how it was quickly translated into a concrete commitment by an international community that is more aware than ever of the need to combat the harmful effects of climate change, a global challenge, This Moroccan ecological shift has resulted in a very ambitious energy plan since Morocco aims to increase the contribution of renewable energy to electricity production to 42% by 2020, and to 52% by 2030. Many projects have already been launched, such as the NOOR solar power plant in Ouarzazate, which aims to produce 2000 MW by 2020, and also the largest wind farm in Africa located in Tarfaya [5].

Morocco is the one of the developing countries, This is why the blessing of this project gives a very important value for the development of the country in terms of climate change and the reduction of CO_2 emissions, Indeed, the distribution of greenhouse gas emissions is shown in the following Figure-1.

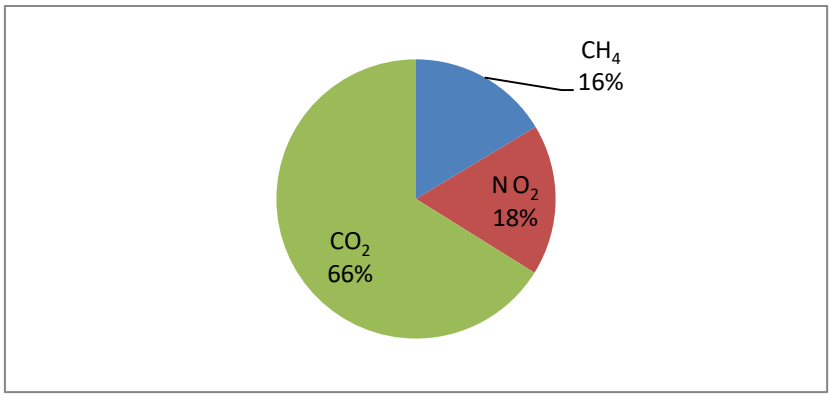

Figure 1-Distribution of greenhouse gas emissions in Morocco

3. MATERIAL AND METHOD

3.1 Classification of emissions

- By Scope (international standards)

Scope 1: Direct emissions, produced by sources, fixed and mobile, necessary for the [6] activities of the legal person;
Scope 2: Indirect emissions associated with the consumption of electricity, heat or steam required for the activities of the legal person;
Scope 3: Other emissions [7] indirectly produced by the activities of the legal entity.

- By Item: each Scope is subdivided into various items

Energy consumption, Freight, Waste, Movement of people, Purchasing, etc.
The present paper has been designed to calculate the emissions emitted by a landfill, so we are in the classification by Item.

3.2 Methodology

The method used in this article is to estimate the reduction of emissions reduced by waste, this reduction is carried out through a mathematical calculation [8] which brings together the different [9] sources that emit the greenhouse gases.

$$ER_y = \left(MD_{project,y} - MD_{reg,y}\right) \times GWP_{CH4} + EL_{LFG,y} * CEF_{elec,BL,y} - EL_{PR} * CEF_{elec,PR,y} + EL_{LFG,y} * CEF_{ther,BL,y} - ET_{PR,y} * ET_{fuel,PR,y} \quad (1)$$

These different parts of this relation has a very important significance for the reduction of the emissions emitted by the waste and according to the discharge one selects the order of importance while taking into account the operation and the duration of the life of each discharge without forgetting the quantity biogas generated by these wastes.

In this discharge the objective was to calculate the quantity of emissions that can be reduced according to the efficiency of the engines used.

4. RESULTAT AND DISCUSSION

The calculation method developed by CDM aims to estimate the emissions that can be reduced [5] in this Landfill, the following figure shows the evolution of reduced emissions in the year, we started the study from 2017 according to the data available in the company that derives this landfill, the lifespan of this Landfill is 45 year, for the year 2017 the reduced emissions of CO2 was estimated of the order of 426880,05 teq CO2/year and with a yield of 70% of operation and later it was possible to reach in the year 2035 the value of 204029,99 teq CO2/year, as shown in Figure-2.

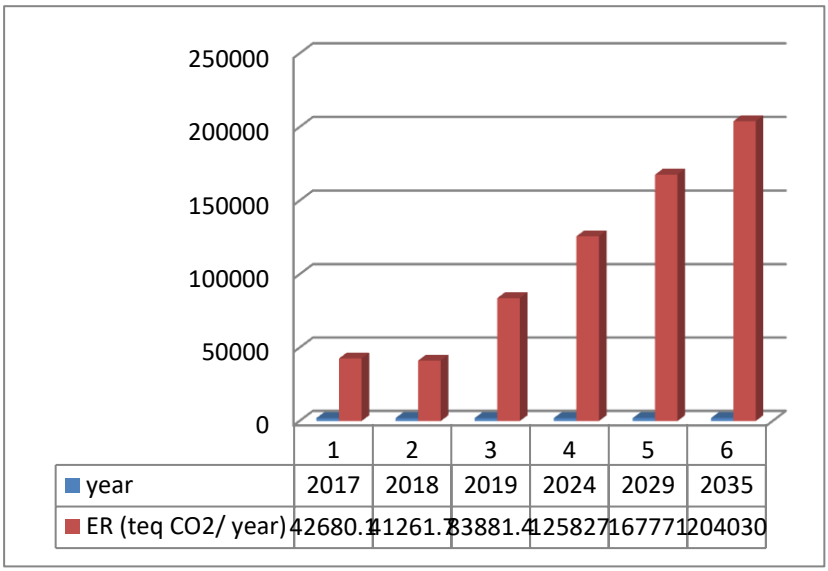

Figure 2-the evolution of emissions reduced over the years

5. CONCLUSION

The controlled landfill of Fez is the first in Morocco. This project has been instrumental in improving the management and operation of the landfill by converting biogas into electrical energy through a megawatt (MW) power plant. This project has made Fez a pioneering city in the field of sustainable development in Morocco and Africa, through the use of clean and renewable energy emanating from its waste for lighting.

Hence the need to recycle these wastes on the one hand and on the other hand to reduce the CO2 emissions emitted by this landfill that can cause a major problem of air pollution in the city, this is why the study of the reduction of CO2 emissions was necessary.

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