

BARRIERS TO THE DEVELOPMENT OF WTE TECHNOLOGIES IN COLOMBIA

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Global cooperation to promote
Waste-to-Energy technologies for a
circular economy society



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Sociedad Antioqueña de
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La Fuerza de la Razón - 1913

**CENTRO DE PENSAMIENTO
ESTRATÉGICO Y DE LIDERAZGO SAI**

The authors, through their experience as project engineers, promoters of WTE projects and as members of the WTERT – COLOMBIA council, have been able to perceive through their professional activity, conferences, seminars, university courses and engineering conferences, different barriers that constitute challenges to attain the developing of municipal waste recovery projects on the desired scale in Colombia. Here the most important barriers, are analysed in the following presentation

The barriers described cannot be considered exclusive to Colombia; surely in other countries in LATIN AMERICA AND THE CARIBBEAN (LAC), the same ones and more can occur. Naturally, the specific nature and impact of each barrier in each country may be different.

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PARQUES TECNOLÓGICOS AMBIENTALES PARA EL MANEJO DE LOS RESIDUOS SÓLIDOS EN LAS SUBREGIONES DE ANTIOQUIA

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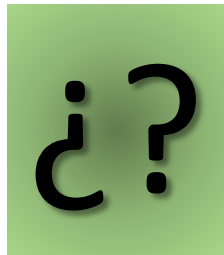
ECONOMÍA SOSTENIBLE Y CIRCULAR
LA TECNOLOGÍA Y LA INGENIERÍA AL SERVICIO DE LAS PERSONAS

PROJECT PRESENTED TO THE REGIONAL PLANNING AGENDA ANTIOQUIA 2040

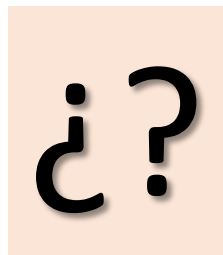
LACK OF KNOWLEDGE OF WTE TECHNOLOGIES FOR ENERGY VALUATION OF WASTE AND GENERAL USE OF WASTE.

There is a lack of sufficient knowledge, on the part of public officials at the municipal, regional and national level, including ministries and environmental authorities, responsible for the management of municipal solid waste (MSW), regarding the existence and operation of WTE technologies. Through the activities and contacts during dissemination of this theme, that the promoters of the WTE projects carry out, it has been possible to perceive the lack of knowledge about the existing alternatives to make final disposal of MSW so that they can be valued, used and recovered, avoid depositing them in dumps or landfills. This lack of knowledge contributes to public officials not deciding to undertake pre-feasibility studies or hiring consultancies on WTE projects, which could allow them to develop strategies for the comprehensive and sustainable management of MSW.

FEAR FEEDS ON LACK OF KNOWLEDGE



Economy
Technology
Flows
Spaces
Resources



<https://education.dsasusa.org/2022/06/16/trash-incineration-and-environmental-racism/>

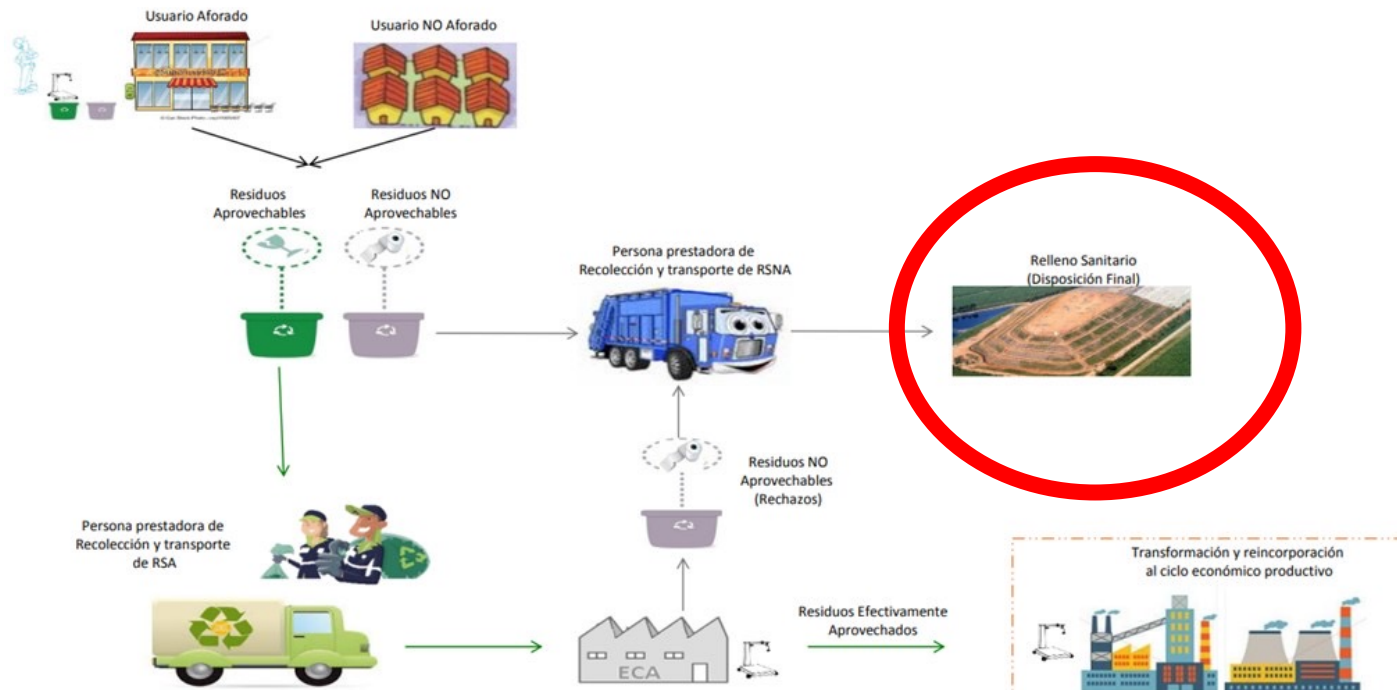


<https://www.theguardian.com/australia-news/2018/apr/11/western-sydney-waste-incinerator-department-nsw>

INTERESTS OF WASTE MANAGEMENT COMPANIES

Companies that collect, transport waste and operate landfills in municipalities, large, medium and small, are likely to consider that they will be negatively affected when municipal officials propose a WTE project to be integrated into the MSW management system. By using the term negatively, it is meant that their income may decrease or even that the concession contract could cease. Currently, municipalities that do not have concessions to collect, transport, dispose and operate the landfill have more freedom to undertake a WTE project. Provided that they first acquire basic knowledge of the technologies so that the idea is born amidst the municipality itself.

Income may decrease
Concession contract could cease
Restrictions
Conflicting interests



RELATIONSHIP BETWEEN POLITICS (THE MANAGEMENT OF PUBLIC AFFAIRS), AND THE FIELD OF TECHNOLOGY AND ENGINEERING

- Politicians and public leaders – Engineering entities, societies and guilds.
- National, regional, municipal legislators – Engineering entities, societies and guilds and unions
- National executives and administrators – Engineering entities, societies and guilds.
- Regional executives and administrators – Engineering entities, societies and guilds.
- Environmental control authorities the national, regional and municipal level – Engineering entities, societies and guilds.

Proposing concepts and projects

Lack of respect and recognition among the political class.

Risks related to schemes where there is corruption or mediocrity in the execution stages of projects



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Antioquia corazón verde de América. Equitativa, educada, competitiva, sostenible, multicultural y en paz.

Presencial y virtual



IV Conferencia Panamericana
Waste to Energy
Junio 22, 23 y 24 2022

Transformando los residuos sólidos en energía

- Junio 22, 23 y 24
- 8:00 am - 5:00 pm
- Fórum Mons. Tulio Botero Salazar-UPB
- Plataforma SAI



INITIAL AND REQUIRED INVESTMENTS AND OPERATIVE EXPENSES

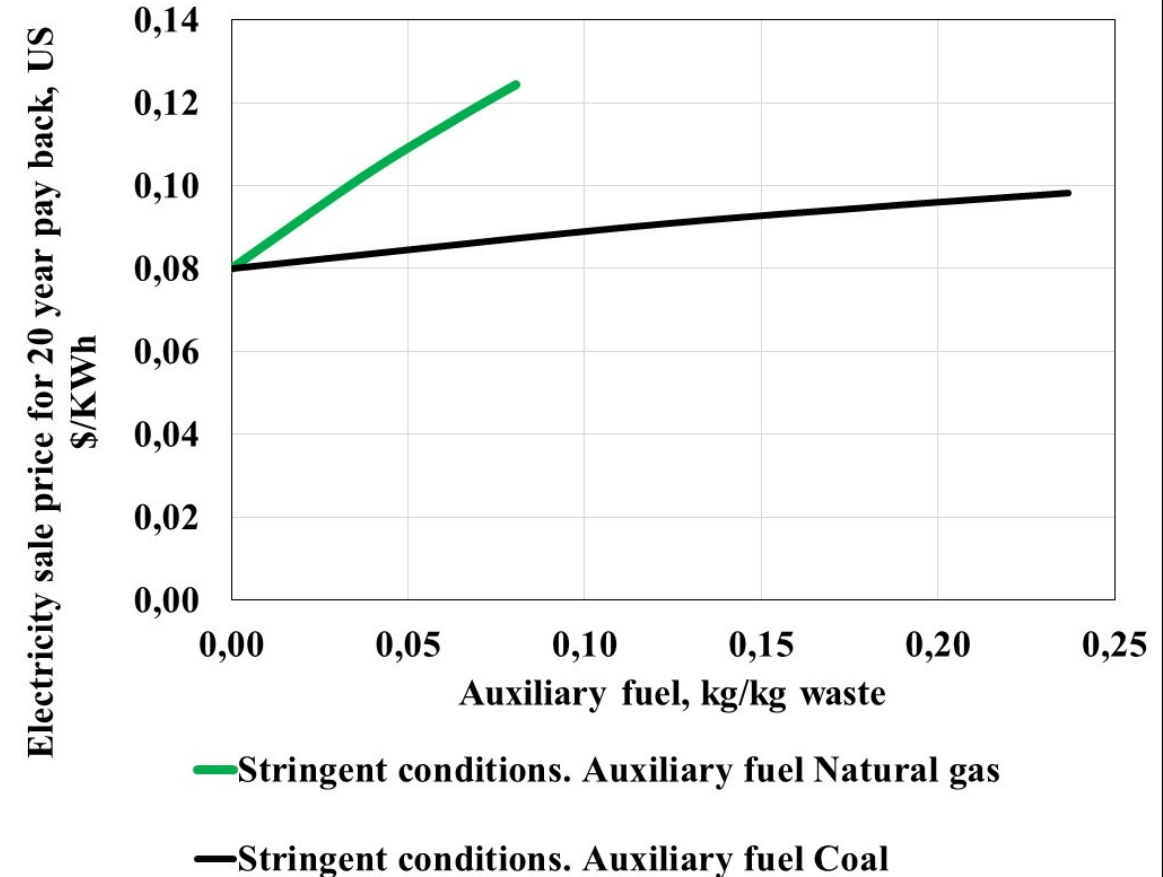
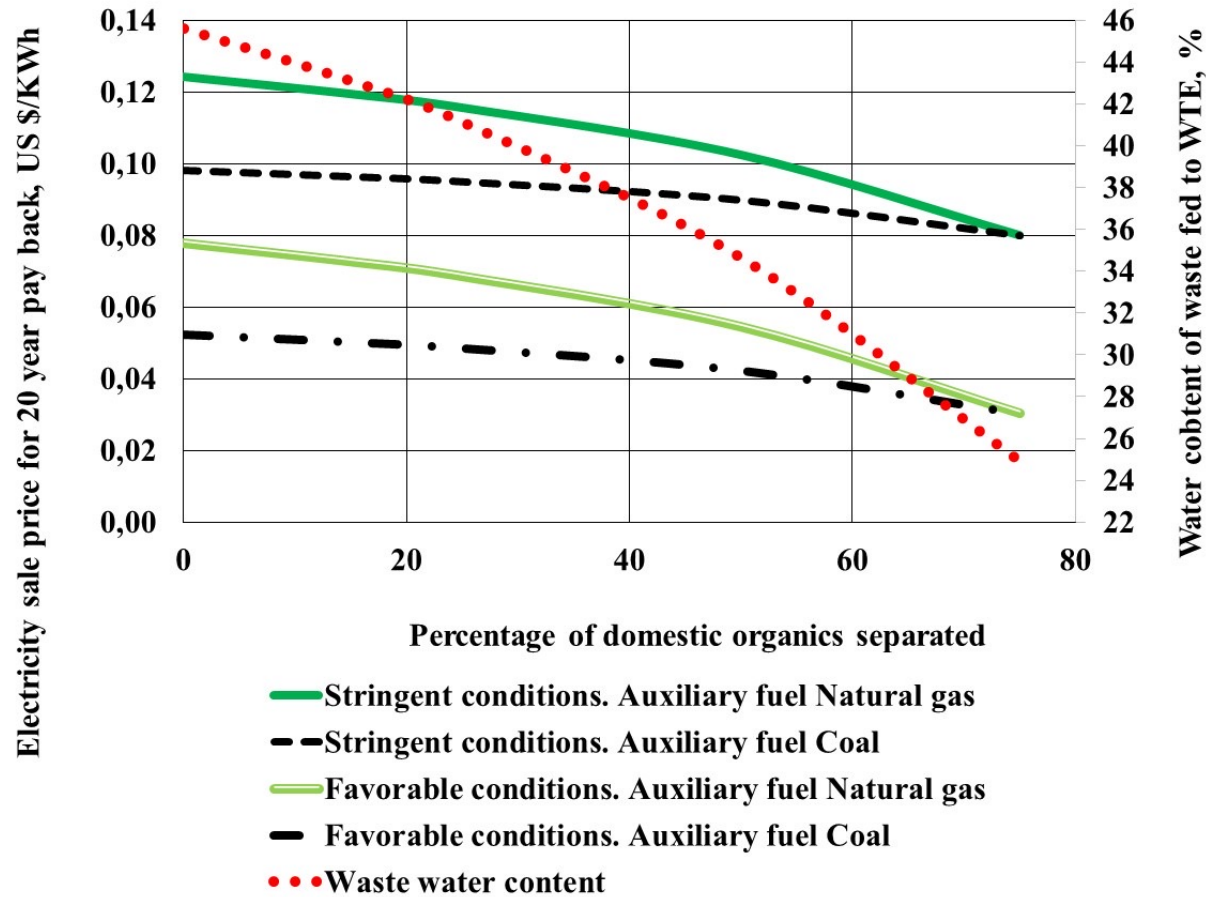
When the political leadership and officials of municipalities, departments or the national government finally understand and accept the social, economic and environmental benefits associated with waste recovery and WTE projects, we have seen that, in general, unfortunately, they move towards denial of the project, since it is considered an impossibility, given the amounts of the initial investment, arguing that it is very high.

Possibly they do that without the benefit of having enough knowledge or existence of a comparative prefeasibility and cost-benefit study, which must be previously prepared, so that it is possible to know which is the most applicable technology and its investment cost.

For example, in Colombia, a biogas plant, with electromechanical equipment is imported from Europe, and that processes around 100 tons/day of organic waste, may require an initial investment of 10 million Euros. Expecting this project to recover the investment and its expenses, considering the sale of by-products such as electricity and biofertilizer, in a few years, is not feasible. It is important to consider within the balance of benefits the assessment of the social, economic and environmental benefits of the project, when 100 tons/day are prevented from being deposited in a land fill, and perhaps in an open dump or in bodies of water. Nor are the benefits of employment, technology development, culture, order, cleanliness adequately considered.

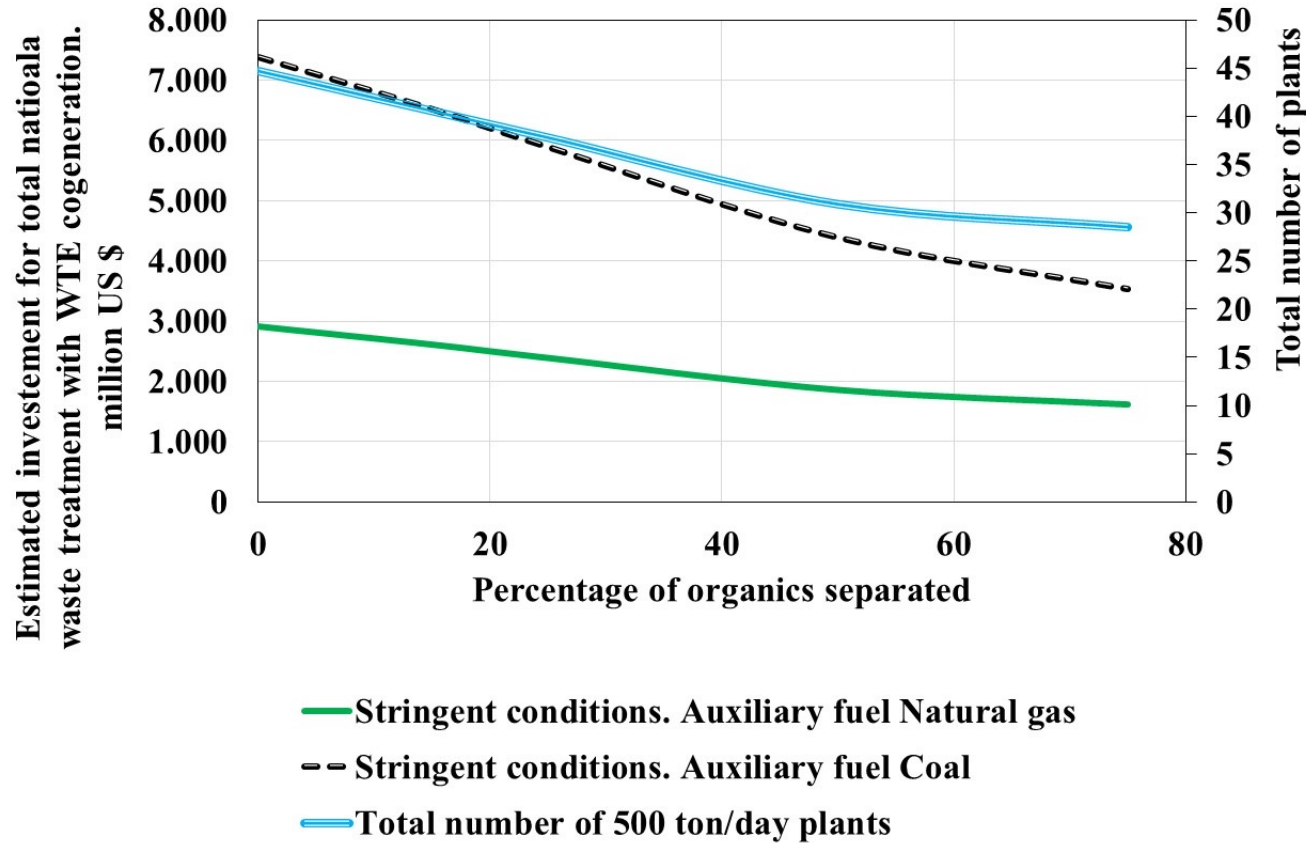
Poverty based mentality = Large amounts of public money for subsidies. Very small amounts for rational and modern waste recovery technology. Recycling based on practices based on popular poverty and informality.

PROPOSED MODEL FOR APPLICATION OF WTE TO SOLID WASTE IN COLOMBIA



Required electricity prices for an WTE cogenerating plant if a 20 year pay back is considered, based on yearly interest on debt of 6 and 10 %, applied to 50 and 100 % of investment (equity by owners) and gate fees of 0,01 and 0,02 US \$/kg, both for natural gas and coal as auxiliary fuels, as function of % organics separated and auxiliary fuel use

PROPOSED MODEL FOR APPLICATION OF WTE TO SOLID WASTE IN COLOMBIA



Plants	Number	29	45
Auxiliary fuel Natural Gas	Investment million US \$	1.620	3.588
Auxiliary fuel Coal	Investment million US \$	2.920	7.400
Population	million	51,5	
PIB (2021)	US \$/habitant	6.100	
Pay back time	years	20	
Minimum annual investment Natural Gas	US \$/habitant	1,57	3,48
Maximum annual investment Coal	US \$/habitant	2,83	7,18
Minimum annual investment Natural Gas	% PIB	0,026	0,057
Maximum annual investment Coal	% PIB	0,046	0,118

Estimated investments for total Colombian national waste treatment, as function of % of organic waste separated, for natural gas and coal as auxiliary fuels. Total number of plants.

LEGAL FRAMEWORK FOR WTE INVESTMENTS

Colombia today has an ample legal framework for renewable energies established the Ministry of Mines and Energy, and by the regulatory decrees issued by the Ministry of the Environment, the resolutions issued by the Mining and Energy Planning Unit of the Ministry of Mines and Energy (UPME), the resolutions of the Energy and Gas Regulatory Commission (CREG). Unfortunately, so far, this framework has placed a lot of emphasis on small hydropower, wind power and solar power and little or no attention has been paid to WTE projects. There are some references to agricultural biomass and waste as a source of renewable energy, that need to be regulated and made practical. In short, the lack of a specific legal framework to generate renewable energy from waste, which consults the interests of the different ministries of the national government, constitutes an obstacle for private or institutional investors, to execute WTE projects.

RESOLUCIÓN 1407 DE 2018

Ministerio de Ambiente y Desarrollo Sostenible

OBJETIVO:

Gestión ambiental de residuos de envases y empaques de papel, cartón, plástico, vidrio y metal. Se establece a los productores la obligación de formular, implementar y mantener actualizado un Plan de Gestión Ambiental de Residuos de Envases y Empaques, que fomente el aprovechamiento.

El Plan de Gestión debe presentarse ante ANLA, y antes del 30 de abril del año siguiente al periodo de evaluación se debe presentar el informe de avance.

EL PRODUCTOR

Tiene la opción de tener un plan individual o participar en un plan colectivo.

El plan colectivo puede aplicar la metodología multicriterio si no lo logra la meta de aprovechamiento.

Metodología multicriterio

- Cobertura geográfica.
- Inversión en innovación.
- Inversión en programas de sensibilización, cultura ciudadana y mecanismos de comunicación.

Aplica a residuos de Envases y Empaques de ventas primario, secundario o de único uso puestos en el mercado nacional y que constituya una unidad de venta al consumidor.

MUNICIPIOS Y DISTRITOS/ AUTORIDADES AMBIENTALES
Persona natural y jurídica

CONSUMIDOR FINAL
Persona natural y jurídica

EMPRESAS TRANSFORMADORAS: Toda persona que transforme el material aprovechable en materia prima y/o producto final y lo desquite a la cadena productiva, y/o realice su valorización energética. Persona natural y jurídica.

El transformador expide la certificación a los Planes de Gestión informando la cantidad de residuos de Envases y Empaques transformados que permiten demostrar el cumplimiento de las metas.

GESTORES DE RESIDUOS DE ENVASES Y EMPAQUES: Toda persona que realice la recolección, clasificación de residuos de envases o empaques. Persona natural y jurídica.

FABRICANTE DE ENVASE Y EMPAQUE
Persona natural y jurídica

PRODUCTOR: Es el dueño de la marca, es decir, aquella persona que con independencia de la fábrica de venta utilizada

Fabrica, ensambla o re-manufactura bienes para su comercialización en el territorio colombiano, de su propia marca con destino al consumidor final y que estén contenidos en Envases y/o Empaques.

Importe bienes para poner en el mercado nacional, con destino al consumidor final contenidos en Envases y/o Empaques.

Ponga en el mercado como titular de la marca exhibida en los Envases o Empaques de los diferentes productos.

Ponga en el mercado Envases y Empaques diseñados para ser usados por una sola vez.

COMERCIALIZADOR: Persona natural o jurídica que comercializa o distribuye bienes importados que sean originarios de países productores para distribución en el mercado nacional. Persona natural y jurídica.

METAS DE CUMPLIMIENTO - Art. 9 de la Res. 1407

PERIODO DE EVALUACIÓN AÑO	INCREMENTO ANUAL (% META)	META DE APROVECHAMIENTO DE RESIDUOS DE ENVASES Y EMPAQUES (%)
2021	10%	10%
2022	2%	12%
2023	2%	14%
2024	2%	16%
2025	2%	18%
2026	2%	20%
2027	2%	22%
2028	2%	24%
2029	3%	27%
2030	3%	30%

Recoplásticos

U2Piloto

BOGOTÁ
Comunicación
Gráfica



INTERESTS OF THE ELECTRICAL SECTOR AND THE WASTE SECTOR

Entrepreneurs in the Colombian electricity sector consider WTE projects that produce electricity as exclusively electrical energy generation projects and only consider the investment cost per kilowatt (kW) installed and the generation cost per kilowatt-hour (kWh), compared with those for hydroelectric, wind or solar projects. This analysis leads to the conclusion that the generation of electrical energy from MSW is not profitable and is not viable. This vision and point of view, clearly incomplete, is shared with actors in the waste sector, who most of the time repeat the same conclusion, forgetting that the interests of both sectors are not the same and do not coincide.



Una apuesta
a nivel
Estatal

MAGIC GARDEN (San Andrés)



**MANY DIFFICULTIES TO GET TO
OPERATE THE ONLY EXISTING WTE
MSW TREATMENT IN COLOMBIA IN
SAN ANDRÉS ISLAND**



ENVIRONMENTAL LICENSE

WTE projects, when they generate electricity, are considered by officials of the environmental authorities as electricity generation projects and not as a sub-project of the municipal solid waste final disposal system. A WTE project, considered an exclusively electric power generation project, in the case of Colombia, must go through the same procedures as a small hydroelectric plant between 1 and 20 MW to obtain an environmental license, which can take between 2 and 4 years.

If a WTE project, intended to be built in a dump or sanitary landfill with an environmental license, is considered as part of the comprehensive and sustainable MSW management system, which allows the use and valorization of solid waste, then the existing environmental license only must be modified. This is equivalent to saying that WTE projects should be considered part of the waste sector and not part of the Colombian electricity sector.

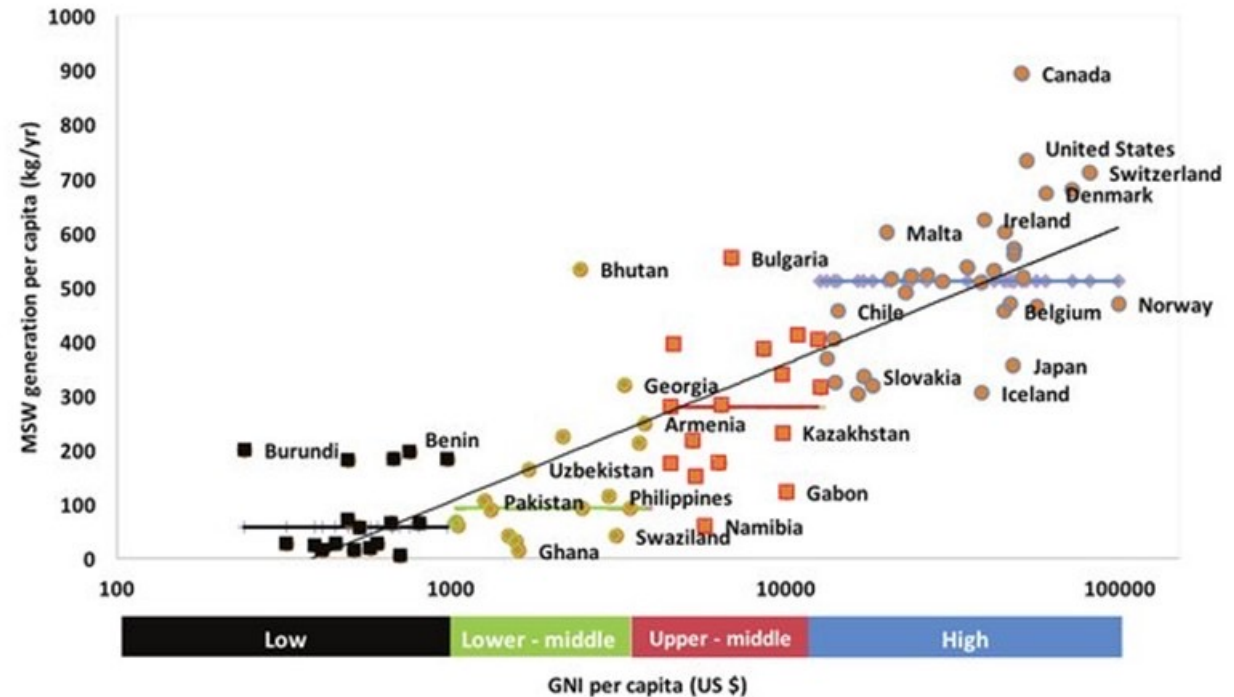
In May 2022, Nadya Rangel, Secretary of Habitat; Luz Amanda Camacho, director of the UAESP; Claudia López, Mayor of Bogotá; Carolina Urrutia, Secretary of the Environment; and Helmuth Gallego, director of BIOGÁS COLOMBIA launching, in Bogotá, the capital, the first plant in continental Colombia that will convert waste into energy. This Project was suspended while innovation and further alternatives are considered.



ZERO WASTE

The programs that some municipalities and departments of Colombia have established under the name “ZERO WASTE”, as has been done in Europe, must be accompanied by tax and coercive measures, so that recycling increases and the use of waste is discouraged and that of dumps and landfills. Given that environmental authorities do not always apply measures such as those mentioned, municipalities prefer to continue implementing dumps or landfills, considering it more economical than any other alternative, leaving future generations to solve the social and environmental problems that they face at a higher investment cost.

Incredibly, the concept of zero waste and its interpretation has also become a barrier. Institutions, companies and many public sector entities can be certified as zero waste, but that does not mean that there is no waste for final disposal. The very concept of zero waste establishes the bases for not carrying out treatment and recovering and waste use initiatives, while waiting for the impossible ideal of no waste generation. Furthermore, this concept ignores the experimental reality that shows that as societies develop, they generate increasing amounts of waste.



TIPPING FEES OR GATE FEE AND ENCOURAGEMENTS FOR SANITARY LANDFILLS

These fees are the rates that landfills currently charge for each ton of MSW they receive for final disposal. In the Colombian case, the applicable norms states: *“Cost of alternatives to the final disposition. Alternatives to final disposal in a sanitary landfill may be used as long as they have the required environmental permits and authorizations and the cost to be transferred to users in the rate does not exceed the value resulting from the sum of the Final Disposal Cost and the Cost of Leachate Treatment.”* In the case of Medellín - Colombia, the landfill collection charges on January 30, 2023, had the following values:

Final disposition = 6.53 (USD/Ton) ; Leachate Treatment = 2.28 (USD/Ton)

From the restriction contained and the final disposal values per ton of MSW shown, it is concluded that the “gate fee”, as currently applied, would not be, in Colombia, either the main source of income or even an important source for it, for a WTE project, as occurs in Europe, where much higher rates are applied, between 40 and 120 Euros/ton. Such national average rates at US landfills, in 2017, were of the order of 51 USD per ton. By comparison, the same rates at WTE facilities are generally higher, in the range of 60 to 110 USD/ton.

This means that to define the financial and capital structure of a WTE project in Colombia, the projected income from gate fees must be substantially improved, if they are to contribute significantly to the economic balance, since they are very low compared to the existing in countries that use such technologies in preference to landfills.

It should be noted that energy sales and sales of recovered materials generally fail to generate sufficient income in the case of Colombia to justify the projects, although in this sense there are windows of opportunity that can be taken advantage of regionally.

LACK OF POLICIES AT THE MUNICIPAL AND DEPARTMENTAL LEVEL

If the municipalities and departments of each LAC country prepare a regional and local policy framed within the national MSW management plan and the international commitments of the national government regarding climate change and MSW management, the benefits in the medium and long term can be classified into at least four categories.

- Environment
- Energy and climate change
- Development of the local and regional economy
- Culture

From the environment, to avoid promoting the construction of more landfills with all their negative environmental impacts.

From climate change, to avoid the generation and release of greenhouse gases in dumps and landfills. The CO₂ equivalent emissions balance clearly favor WTE systems compared to landfills.

From energy, to promote the generation of biogas, electricity and heat, which can be used in other processes.

From the economy, employment is generated, economic activities are created in the region and informality in MSW management decreases.

From culture, customs of order and cleanliness, of good practices, of use and savings, of classification, of social discipline are generated.

**THE SPIRIT OF RULES AND ACTIONS IN COLOMBIA TENDS TO BE REACTIVE, NOT CREATIVE.
THIS IS A BIG BARRIER**

ENVIRONMENTAL GROUPS

In Latin America, any engineering and architectural project that aims to develop the public sector, will encounter extreme environmentalist and fundamentalist groups that oppose the idea of the project, its construction and its operation. These types of groups confront promoting entities, which may be private, but are generally part of the government and environmental authorities that are responsible for processing and granting the environmental license for the project. In these interactions the following considerations may apply:

- The common citizen could receive biased information about the project and influenced to oppose the project.
- The environmental license process could take 4 or 5 times what it should be and turns out to be excessively expensive.
- It may happen that environmental authorities deny the license, arguing that the studies carried out are deficient or incomplete. In this sense, it is important that environmental authorities have in-depth knowledge of waste and WTE utilization technologies and contribute positively to ensuring that the processes are done well, supporting and reviewing them so that they are done successfully. These projects are convenient for everyone.
- Environmental review and criticism systems must be considered as positive means to ensure that projects are carried out with all the necessary quality, not to suspend them or make them unviable.
- It is important to participate in the debates that are promoted and present valuable, true information, based on the abundant experience that there is, to respond to doubts and negativities.
- It is important to thoroughly understand the benefits and costs of these projects, both tangible and intangible, being prepared to present them objectively to interested audiences.

LOCAL TECHNOLOGICAL CAPACITY

In most LAC countries, the technologies, knowledge and experience to develop a WTE project have not been developed yet. This is not due to a lack of capacity, but rather to the fact that this area has not been clearly recognized as one of opportunity for scientific and technological development, by universities, study centers, support entities, societies and business interest groups. Because of this, it is observed that there is a lack of small, medium and large engineering and production companies that can:

- Design and do studies of systems in all stages of project engineering.
- Manufacture components or subsystems required by separation, refining, energy recovery and materials production plants from MSW.
- Provide services that support the operation and maintenance of the plants.

Therefore, it is important to carry out some kind of study or review in each LAC country to recognize the capacity of existing service companies to serve energy recovery and MSW materials plants. In addition, disseminate the topics and point out the major areas of opportunity that exist.

Featured Waste-to-Energy Case Studies



Waste-to-Energy Technology Helps Fish Processor Save on Operating Costs



Sustainable Solutions for an Italian Biochemical Plant



Dairy Feeds Biogas Plant With Whey

<https://www.fluencecorp.com/waste-to-energy-solutions/>

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Desde la **desindustrialización** hacia la **reindustrialización** de Antioquia y sus regiones

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THANKS A LOT FOR YOUR KIND ATTENTION

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